

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

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In the Matter of:
THE INVESTIGATION OF THE
USAIR, INC., FLIGHT 427,
A BOEING 737-300, N513AU
ALQUIPPA, PENNSYLVANIA,
SEPTEMBER 8, 1994
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DOCKET NO. SA-510

Pittsburgh Hilton and Towers Hotel
Pittsburgh, Pennsylvania

Thursday, January 26, 1995

The above-entitled matter came on for hearing
pursuant to notice, at 8:35 a.m., before:

Board of Inquiry

Jim Hall, Member, NTSB
Chairman

William G. Laynor, Deputy Director,
Office of Aviation Safety

Ronald Schleede, Chief,
Major Investigations Division
Office of Aviation Safety

Michael L. Marx, Chief,
Materials Laboratory Division
Office of Research and Engineering

John Clark, Chief, Vehicle Performance Division
Office of Research and Engineering

Technical Panel

Thomas E. Haueter, Investigator-in-Charge,
Hearing Officer

Gregory Phillips, Senior Systems Investigator

Charles Leonard, Operations Investigator

Thomas Jacky, Vehicle Performance Investigator

Cynthia Keegan, Structures Investigator

Roff Sasser, Systems Investigator

Staff:

Michael Benson, Office of Public Affairs

Daniel Campbell, Director
Office of General Counsel

National Safety Transportation Board
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C O N T E N T S

<u>Witness(es)</u>	<u>Page:</u>
BRADLEY JOHNSON, CUSTOMER SERVICE ENGINEER- B-737, BOEING COMMERCIAL AIRPLANE GROUP, SEATTLE, WASHINGTON	933
DAVID KING, SENIOR INVESTIGATOR, AIRCRAFT ACCIDENTS INVESTIGATION BRANCH, FARNBOROUGH, U.K.	976
JEAN MCGREW, B-737 CHIEF ENGINEER, BOEING COMMERCIAL AIRPLANE GROUP, SEATTLE, WASHINGTON	1018
JOHN PURVIS, DIRECTOR, AIR SAFETY INVESTIGATION, BOEING COMMERCIAL AIRPLANE GROUP SEATTLE, WASHINGTON	1090
MICHAEL ZIELINSKI, TEAM LEADER, FEDERAL AVIATION ADMINISTRATION, SEATTLE, WASHINGTON	1120
KENNETH FREY, B-737 SYSTEMS CERTIFICATION ENGINEER, FEDERAL AVIATION ADMINISTRATION SEATTLE, WASHINGTON	1152
DONALD RIGGIN, MANAGER, SEATTLE AIRCRAFT CERTIFICATION OFFICE, FEDERAL AVIATION ADMINISTRATION, RENTON, WASHINGTON	1176
CAPT. THOMAS JOHNSON, DIRECTOR OF TRAINING, USAIR, INC., PITTSBURGH, PENNSYLVANIA	1200

I N D E X

<u>Witness(es)</u>	<u>Page:</u>
BRADLEY JOHNSON	
by Schleede	933
by Phillips	934
by Clark	951
by Schleede	959
by Laynor	964
by Clark	967
by Schleede	970
by Hall	972
DAVID KING	
by Schleede	976
by Phillips	977
by Jacky	996
by LeGrow	1000
by McGrew	1002
by Marx	1003
by Clark	1006
by Schleede	1007
by Laynor	1014
By Hall	1015
JEAN MCGREW	
by Schleede	1018
by Phillips	1021
by LeGrow	1048
by Purvis	1053
by Clark	1054
By Schleede	1058
by Laynor	1066
by Hall	1069
by Schleede	1082

	968
by Clark	1084
by Wurzel	1085

I N D E X

JOHN PURVIS

by Schleede	1090
by Phillips	1091
by LeGrow	1106
by Schleede	1109
by Hall	1111

MICHAEL ZIELINSKI

by Schleede	1120
by Phillips	1122
by McGrew	1135
by LeGrow	1136
by Schleede	1140
by Laynor	1143
by Hall	1146

KENNETH FREY

by Schleede	1152
by Phillips	1153
by LeGrow	1170
by Schleede	1171
by McGrew	1173

DONALD RIGGIN

by Schleede	1176
by Phillips	1178
by Donner	1186

by Hall	1187
by LeGrow	1189
by Clark	1189
by Laynor	1193
by Hall	1196

CAPT. THOMAS JOHNSON

by Schleede	1200
by Leonard	1202
by Sharp	1242
by Clark	1248
by Schleede	1249
by Hall	1254

1 P R O C E E D I N G S

2 [Time noted: 8:35 a.m.]

3 CHAIRMAN HALL: Good morning. I'll call this
4 session of the hearing to order.

5 Our first witness this morning is Mr. Bradley
6 Johnson. He is a Customer Service Engineer on the
7 Boeing 737 with the Boeing Commercial Airplane Group in
8 Seattle, Washington.

9 (Witness testimony continues on the next
10 page.)

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1 BRADLEY JOHNSON, CUSTOMER SERVICE ENGINEER- B-737
2 BOEING COMMERCIAL AIRPLANE GROUP, SEATTLE,
3 WASHINGTON
4

5 (Whereupon,
6 BRADLEY JOHNSON,
7 was called as a witness by and on behalf of the NTSB,
8 and, after having been duly sworn, was examined and
9 testified on his oath as follows:)

10 CHAIRMAN HALL: Good morning and welcome, Mr.
11 Johnson. Mr. Schleede will begin the questioning.

12 MR. SCHLEEDE: Please give us your full name
13 and business address for our record?

14 THE WITNESS: Bradley D. Johnson, Boeing
15 Company, P.O. Box 3707, Seattle, Washington.

16 MR. SCHLEEDE: And what is your present
17 position at Boeing?

18 THE WITNESS: I am a Service Engineer with
19 the Renton Service Engineering Group.

20 MR. SCHLEEDE: Would you describe your
21 education and background for the record for us?

22 THE WITNESS: I have a bachelor of science in

1 mechanical engineering from the University of
2 Washington.

3 MR. SCHLEEDE: How long have you worked at
4 Boeing?

5 THE WITNESS: I've been with the Boeing
6 Company for a little over 10 years and in my present
7 group for a little over six.

8 MR. SCHLEEDE: Thank you.

9 Mr. Phillips will proceed.

10 MR. PHILLIPS: Good morning, Mr. Johnson.

11 THE WITNESS: Good morning.

12 MR. PHILLIPS: Could you briefly describe
13 what your duties are in Customer Service?

14 THE WITNESS: Yes. I'm a member of a group
15 whose primary activity is to receive and respond to the
16 requests of our customers. These requests may be in
17 the form of requests for assistance, repairs,
18 maintenance type questions and a number of other
19 possibilities.

20 This method usually involves coordination
21 within a number of other groups within Boeing and may
22 possibly involve coordination with outside suppliers.

1 MR. PHILLIPS: Before you took your position
2 in Customer Support, did you have any other jobs with
3 Boeing?

4 THE WITNESS: Yes. I worked on the
5 Peacekeeper Missile Program for a short period and then
6 I worked in the structural test lab where we do
7 structural testing of small and large parts.

8 MR. PHILLIPS: Were those job experiences as
9 an engineer or in an engineering capacity?

10 THE WITNESS: Yes, they were.

11 MR. PHILLIPS: Okay. In the customer support
12 area, when an operator notifies Boeing of an in-service
13 difficulty or problem, could you give us a brief
14 description of the process that they use to notify you
15 of a problem?

16 THE WITNESS: Yes. Normally we receive a
17 report from a customer. It may be via phone call or
18 fax, but in most cases it comes in in telex form.
19 Then it is received through our computer system, which
20 is called BOECOM and routed to the appropriate lead
21 engineer by ATA code, at which point the lead engineer
22 assigns it to the appropriate engineer to work it.

1 Our group is divided into two main groups; a
2 structures group and a systems group. Obviously the
3 structures questions go to the structures group and so
4 on, but it eventually filters down to the appropriate
5 engineer to work the question. Then that engineer will
6 take the appropriate steps to coordinate with the
7 cognizant people to work it.

8 In my case, I work a number of questions with
9 groups, such as Mr. Cline's group and other project
10 groups. I coordinate with stress engineering for
11 repairs, a number of groups.

12 MR. PHILLIPS: When a customer reports a
13 problem through your group, do you have the authority
14 to tell the customer what to do to correct the problem?

15 THE WITNESS: It depends on the nature of the
16 problem. If we've seen previous reports, similar
17 reports of equal or lesser degree and we have an
18 established repair, then we are authorized to give the
19 same repair. If it's a situation in which it's a
20 relatively new report, something that we haven't seen
21 before or nothing similar, then we do have to
22 coordinate with other engineering organizations within

1 the company.

2 MR. PHILLIPS: When a customer reports a
3 problem to you and it's been coordinated and you're
4 into the problem resolution phase, do you get involved
5 in the testing or the follow-up of components that have
6 been removed?

7 THE WITNESS: If a component has been removed
8 from an airplane, generally speaking a customer will --
9 may request us to assist them in testing or evaluating
10 and examining the part. And I would be involved in
11 that.

12 MR. PHILLIPS: I'd like to direct your
13 attention to a couple of exhibits here to be a little
14 more specific. First of all, I'd like to start with
15 Exhibit 9-AC, and more specifically, I'd like to turn
16 to a table that begins on page 8. And it's labeled 737
17 Significant Items Report System Servs. Extract 1970 to
18 1994 Lateral Yaw Upsets.

19 Have you seen this exhibit before?

20 THE WITNESS: Yes, I have.

21 MR. PHILLIPS: The exhibit lists beginning
22 from 1970 through the end of November '94 approximately

1 185 circumstances and maintenance actions.

2 Could you describe what this table is and
3 what -- exactly what are we looking at here?

4 THE WITNESS: What this is is a table of
5 events that were in the database that's available to a
6 group different than mine called Reliability and
7 Maintainability. They maintain a database of every
8 report that comes into our organization, as well as
9 they have access to other databases that we don't
10 normally see.

11 I'd like to point out also that when this
12 database was compiled, it was compiled under a request
13 for lateral and yaw upsets, which means that lateral
14 upsets generally tend to indicate that the airplane is
15 rolling side to side as opposed to yaw upsets, which
16 are turning one way or the other. As I looked through
17 this I've found a number of cases in which lateral
18 controls, as well as rudder controls are involved. And
19 the point I'm trying to make here is that this is
20 strictly a report of rudder related events. There are
21 autopilot related events. There are aileron related
22 events and there also are a number of events which are

1 listed as unknown.

2 Not having the specifics on each one of
3 these, what my best estimate would be is that that is
4 something that was -- troubleshooting occurred and no
5 problem was found.

6 MR. PHILLIPS: Is there more specific
7 information --

8 CHAIRMAN HALL: Could you stop there just a
9 second, please?

10 MR. PHILLIPS: Sure.

11 CHAIRMAN HALL: Now, sir, if you would let us
12 known again what is the procedure if there's an
13 incident with a rudder on one of your products,
14 particularly a 737? What information is supplied to
15 you and who has access to that information?

16 I keep hearing things like there are other
17 databases you don't see. My question here is one of
18 accountability. Who in your organization gets these
19 reports and wants to be sure it's in the appropriate
20 hands so if there's a correction needed, somebody in
21 your corporation has the information necessary to take
22 the appropriate action.

1 THE WITNESS: Okay.

2 CHAIRMAN HALL: I'm interested, Mr. Phillips,
3 in getting on the record the information, but what
4 we're trying to find out here is a very simple question
5 of accountability in the chain.

6 THE WITNESS: The normal chain of reporting
7 events that my organization would see is if an operator
8 experiences either an event or has a question of some
9 sort that they need assistance with, they will either
10 contact us directly or they will contact our local
11 representative at their facility, as discussed by Mr.
12 Cohen yesterday.

13 And when they contact us, it's usually in the
14 form of a telex. And when it comes in in that form, it
15 goes into our database.

16 CHAIRMAN HALL: That's where I get a little
17 bit confused. USAir has someone with them that's the
18 Boeing official. Now do they send the telex? Does
19 USAir, the USAir person send the telex or is there a
20 procedure in place for that?

21 THE WITNESS: In most cases when there is a
22 Boeing resident representative on site, the telex is

1 generated by the Boeing resident representative and
2 comes to us. However, due to the number of operators
3 that we have in the field, we don't have a Boeing
4 resident representative at all bases, and also due to
5 possible timing, if USAir experiences something they
6 need assistance with at a time at which the resident
7 representative is not there, USAir has the capability
8 of sending a telex directly.

9 So, that will come into our system and we
10 pick up the information off of our computer system and
11 respond to it directly from there.

12 CHAIRMAN HALL: And you are the person
13 responsible, or your shop is, for receiving the initial
14 report?

15 THE WITNESS: That's correct in this case.

16 CHAIRMAN HALL: And somebody there then takes
17 that report and decides whether it pertains to
18 structure or whether it pertains to systems and it's
19 logged into the computer operation and sent to the
20 appropriate engineer.

21 THE WITNESS: That's correct.

22 CHAIRMAN HALL: What are these other

1 databases you don't have access to? Do they pertain to
2 incidents and problems in the field or not?

3 THE WITNESS: It depends on the way that it's
4 reported by the operator. Such databases as the SDR
5 database, which is reported to the FAA, that may -- or
6 the event that is associated with an SDR report may or
7 may not be reported to us directly.

8 However, there is a different group within
9 Boeing known as Reliability and Maintainability, and
10 that group does have direct access to the SDR database.
11 And to my understanding, regularly monitors the SDR
12 database.

13 CHAIRMAN HALL: And what group is that which
14 is -- are we going to hear from anybody from that
15 group, Mr. Phillips?

16 MR. PHILLIPS: They're not scheduled for this
17 hearing.

18 CHAIRMAN HALL: Do they have any pertinent
19 information to this hearing in that group pertaining to
20 incidents?

21 MR. PHILLIPS: I believe that this exhibit
22 here was prepared by that group in part, so we probably

1 should refer that to the Boeing coordinator for the
2 exact answer to that question, Mr. Purvis.

3 CHAIRMAN HALL: Okay.

4 John, I'm sorry.

5 MR. PURVIS: My testimony will describe those
6 databases. I am not the keeper of them but I know about
7 them and I can talk to you about those. And I'm up two
8 or three witnesses away.

9 CHAIRMAN HALL: All right. Proceed.

10 MR. PHILLIPS: I'd like to go back just for a
11 couple of more minutes here to this Exhibit 9-AC, page
12 8, and this table.

13 Are you aware of why this data or this table
14 was prepared?

15 THE WITNESS: Yes. My understanding is it
16 was prepared at the request of the Systems Group for
17 this investigation.

18 MR. PHILLIPS: Would there be any additional
19 data that would support any more detail into the
20 maintenance actions and the circumstances involving
21 these aircraft?

22 THE WITNESS: There would be data possibly

1 available from the SDR's directly. I don't know a lot
2 about the SDR system. However, --

3 CHAIRMAN HALL: Does Mr. Purvis know about
4 the SDR system?

5 MR. PURVIS: I know about the SDR system. And
6 once again, I'll be able to tell you at least how that
7 goes into the Boeing database and how we use it.

8 CHAIRMAN HALL: All right. Fine.

9 THE WITNESS: However, I should point out
10 that there is a very good likelihood that based on the
11 data that we have available to us from this table, we
12 can go back into our BOECOM system, based on dates and
13 any other information that's available and try to trace
14 a history on any one of these events. And if it was
15 reported to us, we'll be able to find it and much
16 greater details about the event in our BOECOM system.

17 CHAIRMAN HALL: Do you get any information
18 from Parker Hannifin --

19 THE WITNESS: Yes.

20 CHAIRMAN HALL: -- on those units that are
21 sent in to them for service on problems? Where is that
22 maintained?

1 THE WITNESS: If Parker Hannifin notices
2 anything that would be significant, there are a number
3 of different channels they have to communicate with us.

4 CHAIRMAN HALL: Well, what we had testimony
5 on yesterday, Mr. Johnson, -- I don't mean to be
6 cutting off anything, Mr. Phillips, this morning, but
7 we've got a lot of witnesses to go through and we need
8 to get to the meat of these matters. And Parker
9 Hannifin has a computer full of information, according
10 to the testimony we received yesterday. USAir has
11 information. There is information that's in the record
12 from the recording system, the ARSIS system, and the
13 FAA has information. All of that pertains essentially
14 to a product that is built by the Boeing Commercial
15 Airplane Group in Seattle.

16 And my question is how do you -- who is
17 responsible -- are you that individual for bringing
18 that information together and what sort of process it
19 is to evaluate and troubleshoot.

20 I know you do that on a routine basis, but it
21 would help us in just very quickly understanding what
22 is the process. There's a whole lot of information out

1 there. These planes land and takeoff numerous times a
2 day. There are 2600 of them. And I just want to try
3 and get an understanding of if one place you wanted to
4 go and find all the problems on a particular item and
5 be sure you had the full record, do we have it here?

6 THE WITNESS: If you're asking me if I have
7 all that information at my fingertips, the answer is
8 now.

9 CHAIRMAN HALL: Does anybody at Boeing have
10 it? Who is the responsible person? Or if you do not
11 know, I'll wait -- be glad to wait for Mr. Purvis'
12 testimony.

13 THE WITNESS: Mr. Purvis may be able to
14 attest to that. I don't think that all of that
15 information is readily available to anybody at one
16 specific time.

17 CHAIRMAN HALL: Well, let's proceed, sir, and
18 let you testify as efficiently and promptly as we can,
19 Mr. Phillips, on what you do know.

20 MR. PHILLIPS: Okay. Let's move on into
21 Exhibit 9-P, which is a listing of directional upsets
22 from February 1991 through December '94 involving

1 Boeing 737 aircraft.

2 CHAIRMAN HALL: 9-P or B?

3 MR. PHILLIPS: 9-P, papa.

4 CHAIRMAN HALL: P, papa.

5 MR. PHILLIPS: And I'd just like to ask you
6 if you've seen this document before and are aware of
7 its existence.

8 THE WITNESS: Yes, I have.

9 MR. PHILLIPS: Have you provided input to
10 this document?

11 THE WITNESS: Yes, I have.

12 MR. PHILLIPS: More specifically, I'd like to
13 refer to an April 1994 incident involving a Continental
14 Airplane near the Honduras.

15 CHAIRMAN HALL: We're having trouble locating
16 a copy of 9-P for the Chairman. Do you -- here. Okay.
17 Thank you.

18 Do you need one now, Bud? There we go.
19 Thank you.

20 MR. PHILLIPS: It's on page 4, Item 10,
21 Continental Airlines N17344. Were you involved in the
22 investigation or examination of this event?

1 THE WITNESS: I was not involved from the
2 beginning of this event, in the on site investigation
3 or in the examination of parts. I have, however, since
4 become involved and relatively aware of most of the
5 details of this event.

6 MR. PHILLIPS: Could you from memory briefly
7 describe the event, what occurred and what was done by
8 Boeing?

9 THE WITNESS: In terms of the event, our
10 report was that there was an upset during flight. A
11 simultaneous -- it was reported a simultaneous roll and
12 yaw. The pilot quickly controlled the airplane and
13 noted that there was significant force required on the
14 control wheel to maintain straight and level flight.

15 The pilot opted to divert the flight and
16 landed without incident.

17 As far as the sequence of events following
18 that, we received a telephone call from our
19 representative in Denver representing Continental. He
20 informed us of the report and we then contacted our air
21 safety organization who immediately contacted the NTSB.

22 Continental then sent us a follow-up telex

1 which we responded to. They gave us what details they
2 had and requested troubleshooting information on the
3 airplane, which we provided. And we also contacted the
4 FAA at that time to let them know what was known about
5 the event.

6 Following that, Continental requested on site
7 assistance from Boeing. We sent a team of two service
8 engineers to the site of the airplane and a number of
9 troubleshooting efforts were taken. We were on site
10 for a week. A number of parts were removed and shipped
11 to their respective suppliers for examination and
12 testing.

13 The airplane was -- there were no problems
14 found on the airplane on the ground. The removed parts
15 were removed for precautionary reasons.

16 Subsequent testing of the parts revealed only
17 one significant anomaly with the yaw damper solenoid
18 valve. That anomaly was eventually attributed to the
19 initial upset of the airplane and the investigation is
20 still open.

21 MR. PHILLIPS: In regards to that solenoid
22 valve anomaly, has there been any action taken by

1 Boeing to modify or change that design?

2 THE WITNESS: Yes, there has. And it
3 actually has happened significantly before this valve
4 or before this incident.

5 The nature of the failure of this valve was
6 actually addressed and modifications to the valve, that
7 happened almost 10 years ago.

8 MR. PHILLIPS: And you noted that there was
9 an ongoing investigation. Has the cause been
10 attributed to that engaged -- or to that solenoid?

11 THE WITNESS: The initial upset of the
12 airplane has been compared -- or we've analyzed flight
13 data recorder information from this airplane and the
14 data that we've noted is consistent with a failure mode
15 which can be caused by a failure of this or a
16 discrepant operation of this valve. However, the pilot
17 report of continued high control wheel forces from the
18 event all the way to landing is still unresolved. And
19 that's why we are continuing on with the investigation.

20 MR. PHILLIPS: This document, Exhibit 9-P,
21 lists 14 events from February '91 through December '94
22 involving directional upsets. Are you aware of any

1 other events within this time period that don't appear
2 in this document?

3 THE WITNESS: I am aware of a very recent
4 report from an operator that happened shortly before
5 this hearing commenced. That report is actually being
6 worked by our Avionics Group. After some short
7 evaluation of the information that was given to us, it
8 was determined that there was a relay -- excuse me.
9 That is in this report. Excuse me.

10 MR. PHILLIPS: So, in your opinion, then this
11 report is complete for that time period for directional
12 upsets?

13 THE WITNESS: Yes.

14 CHAIRMAN HALL: Are we aware of others?

15 MR. PHILLIPS: I'm not.

16 CHAIRMAN HALL: Okay.

17 MR. PHILLIPS: The last question I had, from
18 earlier, one of your earlier statements, is you
19 mentioned in the Honduras, service engineers were sent.
20 Are they different engineers than like Mr. Cline or Mr.
21 Turner?

22 THE WITNESS: If what you mean by different

1 is do they work for a different organization, the
2 answer is yes. However, they specialize in specific
3 areas. The two that we sent, one of them specializes
4 in mechanical flight controls, specifically laterals.
5 And the second one that we sent was an avionics
6 engineer, specifically specializing in autopilot
7 systems.

8 MR. PHILLIPS: I have nothing else to add.
9 Do you have any other comments?

10 THE WITNESS: No.

11 MR. PHILLIPS: Thank you.

12 CHAIRMAN HALL: Mr. Phillips, is Mr. Purvis
13 going to supply or could we request that somebody from
14 Boeing provide us an organization chart that shows how
15 these -- a flow chart that will give us an idea of how
16 a report flows and how the information flows within --
17 from all these various points?

18 Is that a reasonable request, Mr. Purvis?

19 MR. PURVIS: Yes, sir.

20 CHAIRMAN HALL: Boeing's microphone, please?

21 MR. PURVIS: It's a reasonable request and I
22 have not prepared anything like that. I have no

1 exhibits or viewfoils for my presentation. We could
2 provide that to you later, if you would like.

3 CHAIRMAN HALL: If you could provide it to
4 the record, for the record, I would certainly
5 appreciate it.

6 MR. PURVIS: Yes. We'll work on that when we
7 get back, if that's timely enough.

8 CHAIRMAN HALL: That would be fine.

9 MR. PURVIS: Thank you.

10 CHAIRMAN HALL: Do the parties have questions
11 for this witness?

12 Mr. Marx?

13 MR. MARX: No questions.

14 CHAIRMAN HALL: Mr. Clark? Mr. Schleede?

15 MR. CLARK: I did have some questions.

16 CHAIRMAN HALL: Oh, you do? I'm sorry.
17 Well, you need to stay in your seat.

18 MR. CLARK: I was out for a minute. I was
19 making sure Greg hadn't covered it.

20 CHAIRMAN HALL: Proceed.

21 MR. CLARK: Thank you.

22 Mr. Johnson, I'd like to refer you to Exhibit

1 13-O, and it would be the last page, page 4, 13-O.

2 And while you're looking that up, I'd like to
3 clarify the record on that document a little bit.

4 There is some documentation I believe in 10-C
5 that covers a series of Air France incidents and we're
6 right in the process of gathering more information or
7 details on that. The data plotted in 13-O is for an
8 airplane with the tail number of UA. I believe it's
9 GHUA, but the telex is referring to an airplane with a
10 tail number of GHVM, so there's two different datasets
11 and I don't want to get those mixed up in this line of
12 questioning.

13 The airplane of GHVM was the airplane
14 involved in the first series of incidents that are
15 referred to in Exhibit 10-C. But let me ask, is this a
16 telex that you sent or were involved in? The name
17 Johnson appears at the bottom.

18 THE WITNESS: Yes. If you're referring to
19 telex 140-RR that's dated May 11th, yes. That is a
20 telex that I sent.

21 MR. CLARK: Yes. Okay. In that I assume
22 there were telexes or information that came into your

1 shop regarding this, and this is one telex that was a
2 response from you back to Air France?

3 THE WITNESS: Yes.

4 MR. CLARK: Is there a -- do you maintain a
5 complete file on this or I assume there's a complete
6 record in your files that deals with this that hasn't
7 been provided to us. And I'm requesting that that
8 information be pulled and provided to us.

9 THE WITNESS: Yes. We have a complete file
10 on this and we can make that available.

11 MR. CLARK: Okay. The telex talks about a
12 request that comes in for a reported rudder control
13 anomaly. And in that, you talk about reviewing FDR
14 data. And I assume that it may have been QAR data,
15 Quick Access Recorder data. There may be a difference
16 there we're trying to resolve. But what would you have
17 done with that data or do you recall data coming in on
18 this incident?

19 THE WITNESS: Yes. I do recall data coming
20 in.

21 MR. CLARK: What was the form of that data?

22 THE WITNESS: It was graphical form.

1 MR. CLARK: In graphs rather than a digital
2 printout?

3 THE WITNESS: Correct.

4 MR. CLARK: I'm sure it may be difficult for
5 you. You do recall the parameters that were available
6 on that? At least that part that you looked at.

7 Is that in our record here?

8 THE WITNESS: I don't believe it is.

9 MR. CLARK: Oh, you're looking at your own
10 files?

11 THE WITNESS: Yes.

12 (Pause.)

13 I have a number of parameters listed on that
14 data.

15 MR. CLARK: All right. I think what we want
16 to do is gather that information, take a look at it,
17 and probably turn that into an exhibit here. Okay.

18 THE WITNESS: I might point out that I'm not
19 the one who evaluates this data.

20 MR. CLARK: Okay. I'll get to that.

21 In that, you talk about rudder position and
22 rudder peddle position in your telexes. Are both of

1 those positions in that data?

2 THE WITNESS: Yes, they are.

3 MR. CLARK: Okay. Who would you have sent
4 that data to for evaluation?

5 THE WITNESS: That would go to our Stability
6 and Controls Group for evaluation, Mr. Kerrigan's
7 Group.

8 MR. CLARK: Does that go via a transmittal
9 letter or company mail?

10 THE WITNESS: No. Normal course of action in
11 something like this would be for me to call the group
12 and let them know that we have this type of question
13 and either fax or mail, or both, copies of this
14 information for their evaluation.

15 MR. CLARK: And then do they respond back to
16 you in writing telling you what to say or is it a
17 telephone conversation?

18 THE WITNESS: It may be a telephone
19 conversation if the information is not terribly
20 detailed. If there is significant information that
21 needs to be transmitted, they will probably provide me
22 some sort of a response in writing.

1 MR. CLARK: Within the data that you have
2 there, can you use that data to identify -- what event
3 or what date is your data? Let me rephrase that.

4 Your data is referenced to some flight or
5 some date? Can you provide that to me?

6 THE WITNESS: The data that we have was data
7 that was forwarded to us by Air France in reference to
8 the incoming telex in which they requested us to
9 evaluate the data. That's pretty much the only
10 identifiable method that we have to determine where
11 it's from.

12 MR. CLARK: I guess the handicap I'm under
13 right now is that I don't have all of the
14 correspondence. I only have one response from you back
15 to Boeing, so that's a little difficult to sort out.

16 I think we're just simply going to have to
17 get the docket and review it or gather the data and
18 make sense. We may not be able to complete all of
19 that.

20 CHAIRMAN HALL: Is this what we had requested
21 previously, Mr. Clark, and didn't get, or what?

22 MR. CLARK: Part of the issue is, I believe

1 we requested all information and knowledge and I wasn't
2 the requestor so I'm a little handicapped.

3 CHAIRMAN HALL: I was the Chairman who was
4 requesting. The Chairman went to Seattle, had a very
5 delightful lunch with lots of the folks there and
6 specifically said -- this is not? Proceed ahead.

7 MR. CLARK: Okay. My understanding is that
8 this issue -- we have several lists of events and we
9 requested data on that. And this airplane, this event,
10 did not show up on that list.

11 And then there are several other events where
12 the parts were changed to another airplane, of which we
13 are just gathering data from Air France now and what --
14 I have no idea whether that particular dataset got to
15 Boeing in any shape or form.

16 CHAIRMAN HALL: Well, I'm going to ask Mr.
17 Purvis when he's up here that -- again, that we are
18 looking at the rudder. That's correct?

19 MR. CLARK: Yes.

20 CHAIRMAN HALL: And that any information that
21 Boeing Corporation has in regard to -- is the proper
22 word anomalies? Problems with that rudder that might

1 assist us in this information, we need.

2 MR. CLARK: Yes.

3 CHAIRMAN HALL: Is that simple enough?

4 MR. CLARK: The other thing I would expand is
5 this apparently has taken the form that at least the
6 dataset that goes with this telex alleges that there
7 was a rudder kick or an oscillation and then Boeing
8 determined that it wasn't. And I think we want whatever
9 information on alleged rudder kicks that may be coming
10 in also that Boeing may eventually determine that are
11 some other issue.

12 CHAIRMAN HALL: I know we're talking about a
13 number of aircraft, some 2600 that operate -- how many
14 different operators are there around the world?

15 MR. MCGREW: 95.

16 CHAIRMAN HALL: 95 different operators around
17 the world. How long has the plane been operational?
18 How many years?

19 MR. CLARK: Since December of 1969.

20 CHAIRMAN HALL: So over 25-26-27 years of
21 information. So I understand it's a lot of
22 information.

1 But Mr. Johnson, that is your responsibility,
2 right? Is the -- these reports come to you?

3 THE WITNESS: That's correct.

4 CHAIRMAN HALL: And I assume you weren't
5 there 26 years ago, were you?

6 THE WITNESS: No, I was not.

7 CHAIRMAN HALL: So you -- but are there
8 records for that? Is what we're seeing here
9 information that's been maintained over a period of
10 time; right?

11 THE WITNESS: That's correct.

12 CHAIRMAN HALL: Now the Board has some very
13 highly trained technical people with years of
14 government service that can review this information.
15 The Chairman is not one of them, but the Chairman asked
16 that that information be made available and be sure
17 that all of it is made available for the purposes of
18 this investigation.

19 John, you can continue.

20 MR. CLARK: I think in the interest of
21 expediency right now, Mr. Chairman, to try to sort out
22 which telexes go with which datasets, it would be more

1 expedient for us to gather that data and sit down and
2 try to sort it out without trying to sort it out in
3 this forum.

4 Sorry. What I was saying was that trying to
5 sort out telexes that are not well defined with
6 datasets that are not well defined, with a French memo
7 that -- they may not be directly connected. To try to
8 sort that out in this forum is going to be very
9 burdensome and cumbersome. It would be much more
10 expedient to get the data, look at the data and see if
11 we can't make some sense in a fairly quick manner.

12 At least get the data on the record and
13 follow up, if we have to do it later in the hearing or
14 even at a later date.

15 CHAIRMAN HALL: Very well.

16 Mr. Schleede?

17 MR. SCHLEEDE: I would like to follow up on
18 that particular exhibit, the last page. It's
19 unnumbered but it's a telex with your name on the
20 bottom. It's Exhibit 13-O.

21 I may have missed it there, but could you --
22 I know this was a while ago, but that second paragraph

1 where it says "our review of the flight recorder graphs
2 has revealed no apparent rudder control or yaw damper
3 anomalies," and then it goes on.

4 Can you tell us how that particular statement
5 was derived? Is that your statement or is that
6 something someone gave you or told you to say?

7 THE WITNESS: That was a statement that was
8 developed after a review of the data by our Stability
9 and Controls Group, and was transmitted to me during a
10 telephone call.

11 MR. SCHLEEDE: And the incidents -- there
12 were multiple incidents here involving two different
13 aircraft over a several day period. None of these show
14 up, to my knowledge, in this data that was provided
15 from your computer records. Is that correct? We're
16 unable to find it.

17 THE WITNESS: Are you still referring to --

18 MR. SCHLEEDE: The Air France --

19 THE WITNESS: -- Exhibit 13-O?

20 MR. SCHLEEDE: Yes.

21 THE WITNESS: 13-O is -- to my knowledge, is
22 not related to any previous reports from Air France.

1 It's an entirely -- this is the first time that this
2 airplane has been reported to us in this regard.

3 MR. SCHLEEDE: This telex here is the first
4 time?

5 THE WITNESS: The incoming telex that this
6 was a response to is the first time that we saw a
7 report on this particular airplane.

8 MR. SCHLEEDE: But my question was it wasn't
9 entered in your databases, the later or directional
10 upset event?

11 THE WITNESS: Oh, yes. It definitely becomes
12 a member of that.

13 MR. SCHLEEDE: Well, my point is we aren't
14 able to find it in that list of 187 that was provided
15 to us.

16 THE WITNESS: Oh. I don't -- I think that
17 because of the fact that I'm not too sure how the
18 database is put together by the other group that does
19 this.

20 MR. SCHLEEDE: Maybe I can help you here. It
21 says your review revealed no apparent rudder control or
22 yaw damper anomalies. I was assuming that that's why

1 it wasn't entered in your database.

2 THE WITNESS: That's what I was getting to.

3 MR. SCHLEEDE: Oh, I'm sorry.

4 THE WITNESS: Because I don't know how they
5 put that together. They may have reviewed the incoming
6 and then reviewed this and decided it was not an event
7 and didn't put it in. But I don't know that for a
8 fact.

9 MR. SCHLEEDE: Okay. Who in your company is
10 responsible for the compliance with the provisions of
11 FAR 21.3, reporting of failures, malfunctions and
12 defects?

13 THE WITNESS: I'm sorry. I didn't understand
14 the question.

15 MR. SCHLEEDE: Do you have Exhibit 9-AE
16 there?

17 THE WITNESS: Yes.

18 MR. SCHLEEDE: The first page, bottom left.
19 Are you familiar with this regulation 21.3?

20 THE WITNESS: Not specifically, no.

21 MR. SCHLEEDE: Is it your office's
22 responsibility to report to the FAA?

1 THE WITNESS: Yes, it is.

2 MR. SCHLEEDE: Okay. Well, look over on the
3 right-hand side, Item 11, then.

4 THE WITNESS: Yes.

5 MR. SCHLEEDE: Are you familiar with this
6 regulation at all, first of all?

7 THE WITNESS: Not intrinsically, no. We have
8 a document in process within our organization that
9 outlines how and when we report to the FAA incoming
10 communication that would be reportable. I'd like to
11 comment that I am relatively familiar with that
12 document and the information that I'm looking at here
13 looks almost identical to what's in that in-house
14 document.

15 MR. SCHLEEDE: Okay. Well, could you
16 describe to us the reference to Item 11? It says any
17 structural or flight control system malfunction, defect
18 or failure which causes an interference with normal
19 control of the aircraft or which derogates the flying
20 qualities. That's one of the reportable events, which
21 it says the type certificate holder of an airplane
22 manufacturer shall report these to the FAA.

1 How is that done and who's responsible for
2 that at Boeing?

3 THE WITNESS: When a telex comes in to us
4 that appears as though it may be reportable, there may
5 be instances in which there's no question, in which
6 case we fill out a form that is then forwarded to our
7 Airworthiness Group and it is coordinated with the
8 appropriate DER, at which point it's forwarded on to
9 the FAA.

10 MR. SCHLEEDE: How long does that process
11 take?

12 THE WITNESS: Once it leaves my hands, I
13 don't know how long it takes.

14 CHAIRMAN HALL: Yes, sir. Mr. Purvis,
15 Boeing, microphone, please.

16 MR. PURVIS: That subject will be also
17 covered in detail by Mr. McGrew, the next Boeing
18 witness up.

19 MR. SCHLEEDE: One other area. You mentioned
20 that some things go to the Reliability Group or
21 something. I think in your earlier testimony you said
22 there's a Reliability Group?

1 THE WITNESS: Yes. There's a group
2 identified as the Reliability and Maintainability
3 Group, and their function is to monitor communications
4 out of our office. They routinely monitor SDR's and
5 I'm not sure if they have access to the ASRS system or
6 not.

7 (Pause.)

8 MR. SCHLEEDE: Thank you. I have no further
9 questions.

10 CHAIRMAN HALL: Any questions, Mr. Laynor?

11 MR. LAYNOR: I'm not sure that you're the
12 appropriate person to respond to this either, Mr.
13 Johnson, but how often does your review of incident
14 reports or service difficulty reports result in
15 corrective measures by Boeing, the issuance of service
16 bulletins and such?

17 THE WITNESS: I don't know that I have any
18 statistics on that.

19 MR. LAYNOR: Could you comment about the
20 criteria that are used in initiating such actions?

21 THE WITNESS: Yes. Obviously if something is
22 a safety of flight issue, it receives immediate

1 attention. We have a process known as the SRP process,
2 Service Related Problems, and that is used to initiate
3 action. And based on the severity of the action is how
4 that -- what type of priority something like that is
5 given.

6 If it's a safety of flight issue it receives
7 absolute top priority and receives attention of upper
8 level management and all appropriate groups on a very
9 regular routine basis.

10 If it's a reliability issue, it still
11 receives the same attention from the same people but
12 the priority is not as high.

13 MR. LAYNOR: And service history on yaw
14 dampers would fit in the latter category in the
15 reliability issue?

16 THE WITNESS: Yes. Based on, as has been
17 testified before, that yaw damper events are completely
18 controllable.

19 MR. LAYNOR: Okay. Just one more question
20 then getting back to the telex, 13-O. Who decides
21 which area of expertise in the company reviews the
22 incoming data? Is that your group or would that fit in

1 engineering under Mr. McGrew?

2 THE WITNESS: Generally speaking, our group
3 would forward it to the group that we believe would be
4 most likely to review it or to be the experts in the
5 area. If they are not, they will tell us that and it's
6 then our responsibility to continue to pursue it until
7 we find the best group to deal with it.

8 MR. LAYNOR: Well, I guess we can pursue a
9 little bit later what kind of coordination and all, but
10 one of the things that bothers me in the answer to this
11 particular problem is matching rudder surface position
12 with rudder control position. Because we've also had
13 testimony and a description of the system that the
14 rudder surface will backdrive the controls, so it's
15 very difficult to ferret out whether this is a pilot
16 command or a backdrive command.

17 And I suspect Mr. McGrew may be able to
18 answer that.

19 THE WITNESS: I'm not sure I understand your
20 comment. Are you under the impression that a yaw
21 damper will backdrive the rudder peddles?

22 MR. LAYNOR: Not the yaw damper but if I were

1 reviewing data on a flight recorder that just had
2 rudder surface position and I was saying, well, it's a
3 result of controls, I might be misled. I think we can
4 pursue it further, but I would think that the Systems
5 Group, as well as the Stability and Control Group would
6 be appropriate to look at this kind of data.

7 THE WITNESS: Yes. They would be involved.

8 MR. LAYNOR: Okay. That wouldn't be your
9 decision? That would be somebody else's decision?

10 THE WITNESS: It absolutely is my decision in
11 concert with all the other involved parties. There's -
12 - it appears to me that there's an impression of an
13 isolation of individual groups and that's not the case.
14 We talk to each other on a regular basis and if we need
15 expertise from another group, we'll go get it.

16 MR. LAYNOR: Okay. All right. Thank you,
17 sir.

18 CHAIRMAN HALL: I believe Mr. Clark now has
19 another question or two for you, Mr. Johnson, and then
20 Mr. Schleede.

21 MR. CLARK: Very quickly. A few moments ago,
22 referring to this memo, I believe you stated that

1 another office or another group of people define how
2 this incident would have been categorized in the
3 database. What's the name of that group or who are
4 they?

5 THE WITNESS: Reliability and
6 Maintainability. Let me point out that that isn't in
7 their database, which is a relatively quick access
8 database that can be cross-referenced fairly easily.
9 As far as our database is concerned, which is the
10 BOECOM database, all the information goes in and stays
11 in and never comes out and it's always retrievable.

12 MR. CLARK: Okay. Maybe this is the way we
13 need to approach it.

14 My next question was is there any way to go
15 back into your records and track this type of action
16 where it apparently came in as an alleged rudder kick
17 oscillation and Boeing engineers concluded otherwise?
18 I mean, you're saying Reliability and Maintainability
19 categorized it as -- some of them, I assume, or none.
20 How is it categorized in your database?

21 THE WITNESS: We're able to search by a
22 number of parameters: by operator, by date range. But

1 our most common search method is by ATA categorization.
2 We don't have the ability in our present database to
3 put in a key word and search by key word.

4 MR. CLARK: Okay. So if somebody came to you
5 and said give us all the rudder anomaly problems, this
6 should have shown up?

7 THE WITNESS: If you'd asked for that, we
8 would have searched by ATA.

9 MR. CLARK: ATA code?

10 THE WITNESS: ATA code. It should show up,
11 and in this particular case it would. However, because
12 of the way that items are reported to us on a regular
13 basis, especially if it comes from an operator,
14 especially a remote operator that does not have a
15 Boeing representative on site, it may very often come
16 in under an ATA code that is not consistent or wouldn't
17 show up under our search, which is why it would be very
18 labor intensive for us to try to go find every single
19 one that came in.

20 MR. CLARK: Okay. In this situation, I've
21 seen an ATA Code of 2725-10, reference to the 737-300.
22 Is that -- are you --

1 THE WITNESS: Yes. That would very easily
2 get picked up. Anything under 2720 would be picked up.

3 MR. CLARK: Were you involved in any kind of
4 data search to look for rudder anomalies when this list
5 of 197 showed up?

6 THE WITNESS: With that particular search, I
7 was not involved.

8 MR. CLARK: Was your group involved?

9 THE WITNESS: Our group was not involved.
10 Our direction was to -- I don't have the specific
11 request in front of me, but our direction was to try to
12 obtain data in a manner that was not excessively labor
13 intensive, in which case the request was forwarded to
14 the Reliability and Maintainability Group because they
15 have the most rapid access to this type of information.

16 CHAIRMAN HALL: Excuse me, Mr. Clark.

17 Mr. Johnson, could you help us draft a letter
18 to Boeing and would you tell me what I need to put in
19 that letter to request your assistance in obtaining
20 whatever information you have in regard to rudder
21 anomalies?

22 THE WITNESS: Chairman Hall, I really don't

1 want to tell you your job.

2 CHAIRMAN HALL: Well, I'm asking for help. I
3 need to help for ATA code numbers?

4 MR. PURVIS: Mr. Chairman?

5 CHAIRMAN HALL: Yes, sir.

6 MR. PURVIS: We hear your request and I don't
7 think you need a letter. We'll take it and go with it
8 based on this request.

9 CHAIRMAN HALL: Thank you, John.

10 Please proceed.

11 MR. CLARK: I'm all through. Thank you.

12 CHAIRMAN HALL: Mr. Schleede?

13 MR. SCHLEEDE: I just wanted to clear up.

14 When you mentioned that you determined something was a
15 safety of flight item, who makes that determination and
16 how is that done?

17 THE WITNESS: In some cases it's very clear
18 and we can make the determination directly. In cases
19 in which it's not, it may be a gray area, it doesn't
20 fit precisely into one of those categories that you
21 referred to in the FAR, we will contact our DER and
22 discuss it with him and determine whether we believe it

1 should be reported or not.

2 MR. SCHLEEDE: If you received a report today
3 of an operator had an upset, pilot reported a rudder
4 kick, 45 degrees of bank, flight attendant got knocked
5 down and this was a brand new operator, what advice
6 would you give to the rep to help the operator with
7 that type of event?

8 THE WITNESS: First I would review the report
9 and the request for information.

10 MR. SCHLEEDE: Okay. Let me just add the
11 report says the pilot turned off the yaw damper and
12 autopilot and landed safely.

13 THE WITNESS: I suppose first I would ask for
14 FDR data. Actually, the very first thing I'd do would
15 be to contact the appropriate groups, especially
16 Stability and Controls, the Power Control Group, the
17 Systems Group that's responsible for the rudder control
18 system and we'd put them all on a telephone call,
19 conference call, and discuss what is known.

20 MR. SCHLEEDE: Because I assume the airplane
21 is on the ground now and the operator wants to get it
22 flying. How much time does this take?

1 THE WITNESS: A matter of less than a minute
2 in most cases.

3 MR. SCHLEEDE: And what type of advice would
4 you give in this type of event that I described to the
5 maintenance crew?

6 THE WITNESS: Well, here again it would
7 depend upon the inputs of all those involved and what
8 information we had so far, but generically I would say
9 we'd want to see the flight data recorder information
10 and there would be a few items that we would expect
11 them or request that they look at; standby rudder, yaw
12 damper, coupler. We'd want them first to look at the
13 yaw damper, do a flight check on the yaw damper
14 coupler, see if that indicates anything to us, and then
15 go from there.

16 MR. SCHLEEDE: Okay. And the flight check
17 shows an anomaly, a step input hardover on the yaw
18 damper and they change that out. Is that event going
19 to go in as a safety item or a reliability problem?

20 THE WITNESS: I would have to coordinate that
21 with the DER.

22 MR. SCHLEEDE: So that decision is not made

1 by you. Okay.

2 That's all I had, Mr. Chairman.

3 CHAIRMAN HALL: Mr. Johnson, just a few brief
4 questions.

5 How many -- are you head of this unit? Is
6 this --

7 THE WITNESS: No.

8 CHAIRMAN HALL: Who is your boss then?

9 THE WITNESS: I report to a lead engineer,
10 who reports to a supervisor and on up the chain to a
11 director.

12 CHAIRMAN HALL: Is this a customer service
13 group, this contact point that's your responsibility?

14 THE WITNESS: I'm not sure I understand the
15 question.

16 CHAIRMAN HALL: I'm trying to understand the
17 nature of the testimony we're getting here, Mr.
18 Phillips (sic). What is your job with Boeing?

19 THE WITNESS: My job is to receive requests
20 for information or assistance from the operators and to
21 coordinate with --

22 CHAIRMAN HALL: All the operators worldwide?

1 THE WITNESS: Yes.

2 CHAIRMAN HALL: Now is that your sole
3 responsibility? How many people assist you with that?

4 THE WITNESS: No. I am one of a group of
5 about 120 or 130 people that does that. My job is
6 system specific.

7 CHAIRMAN HALL: You all have the world
8 divided up?

9 THE WITNESS: Yes. We're all divided up
10 either by structure or by system.

11 CHAIRMAN HALL: Okay. And so if it comes in,
12 it's a systems problem, it may come to you depending on
13 who it comes from?

14 THE WITNESS: No. It doesn't matter who it
15 comes from. It depends on what the system is. In my
16 case, my primarily responsibility is rudder systems.

17 CHAIRMAN HALL: Rudder systems. Okay. Very
18 good. So USAir reports a problem. Who is the first
19 person that gets that?

20 THE WITNESS: The first person that would get
21 that in most cases would be my lead engineer. It comes
22 in through an automated system in the computer and it's

1 sorted by ATA code. And then all of the messages under
2 the ATA codes that are under the responsibility of my
3 lead engineer, they go to him.

4 CHAIRMAN HALL: Your job description is you
5 enter these ATA codes that are reported from the
6 customers?

7 THE WITNESS: Correct.

8 CHAIRMAN HALL: That's helpful. I'm getting
9 an understanding, sir, of how this operates. Now,
10 then, if it involves a rudder, you have other folks you
11 report that to, right; review it with?

12 THE WITNESS: Yes.

13 CHAIRMAN HALL: Now if it's a rudder problem
14 similar to this Air France situation, is that
15 information entered in the computer under that ATA code
16 or does someone make a determination that that report
17 is a rudder problem before it's then entered into the
18 ATA code?

19 THE WITNESS: No.

20 CHAIRMAN HALL: In the computer. I'm sorry.

21 THE WITNESS: Anything that comes in to my
22 organization is in the computer already.

1 CHAIRMAN HALL: So if we were to go and
2 request a data dump -- is I think the word -- of all
3 the information that's come in under a particular code,
4 that information is in your job? You're the rudder
5 man?

6 THE WITNESS: Yes.

7 CHAIRMAN HALL: And you said earlier that on
8 this previous request for information you were not
9 involved in putting together the information?

10 THE WITNESS: Not on that table that you see.

11 No.

12 CHAIRMAN HALL: That's all the questions I
13 have. You're excused.

14 (Witness excused.)

15 CHAIRMAN HALL: The next witness is Mr. David
16 King, Senior Investigator for the Aircraft Accidents
17 Investigation Branch from Farnborough, United Kingdom.

18 (Witness testimony continues on the next
19 page.)

1 DAVID KING, SENIOR INVESTIGATOR, AIRCRAFT ACCIDENTS
2 INVESTIGATION BRANCH, FARNBOROUGH, UNITED KINGDOM

3

4 (Whereupon,

5 DAVID KING,

6 was call as a witness by and on behalf of NTSB, and,
7 after having been duly sworn, was examined and
8 testified on his oath as follows:)

9 CHAIRMAN HALL: Welcome, Mr. King to
10 Pittsburgh and the United States. And I will turn it
11 over to Mr. Schleede.

12 THE WITNESS: Thank you.

13 MR. SCHLEEDE: Mr. King, could you give us
14 your full name and business address for our record?

15 THE WITNESS: My name is David F. King. My
16 business address is the Air Accidents Investigation
17 Branch of the Department of Transport at Building T-75-
18 DRA, Farnborough, Hampshire, England.

19 MR. SCHLEEDE: And what is your position at
20 the AAIB?

21 THE WITNESS: I'm a principal inspector of
22 air accidents.

1 MR. SCHLEEDE: And how long have you worked
2 for the AAIB?

3 THE WITNESS: In that position, for eight
4 years. I've actually been with the Accidents
5 Investigation Branch for 23 years.

6 MR. SCHLEEDE: Could you give us a brief
7 description of your education and other experience that
8 brings you to your present position?

9 THE WITNESS: I have a bachelor of science
10 honors degree in aeronautical engineering. I have a
11 master's degree in business administration in
12 engineering management. I'm a chartered engineer and a
13 fellow of the Royal Aeronautical Society.

14 I completed a nine year apprenticeship of
15 diverse training with an airframe manufacturer in the
16 United Kingdom.

17 MR. SCHLEEDE: Thank you very much.

18 Mr. Phillips?

19 MR. PHILLIPS: Good morning, Mr. King.

20 THE WITNESS: Good morning.

21 MR. PHILLIPS: A couple of areas of
22 questioning.

1 In your day-to-day duties as an Air Accidents
2 Investigator, principal Air Accidents Investigator in
3 the U.K., could you tell us what you do?

4 THE WITNESS: Yes. I manage a group of
5 investigating engineers. I manage the hangar and
6 engineering facilities that we have at Farnborough and
7 I perform the role of our of our duty coordinators.
8 That's to say I am one of the people that receives the
9 first notification of an accident in the U.K. or with a
10 U.K. interest, and I determine what the response of our
11 organization shall be, and I also perform in the role
12 of investigator-in-charge of major investigations.

13 MR. PHILLIPS: Could you give us an idea of
14 some of the major accident investigations in the U.K.
15 that you've been involved with?

16 THE WITNESS: Lockerbie, Boeing 747 is one
17 many people here I'm sure are aware of. Boeing 737,
18 British Airways, at Manchester in 1985. Chinook in the
19 BB324 in the North Sea. There are a large number, but
20 they're typical.

21 MR. PHILLIPS: You recently investigated an
22 incident involving a Boeing 747 aircraft on departure

1 from London Heathrow Airport, 7 October 1993. Could
2 you briefly describe the circumstances of that
3 incident?

4 THE WITNESS: Yes. This was the first flight
5 of the airplane after some corrective maintenance. The
6 aircraft has four hydraulic systems and on one of these
7 hydraulic systems the engine driven pump, air driven
8 pump and significant sections of piping had just been
9 replaced. And the aircraft was then scheduled for a
10 passenger flight from London Heathrow to Bangkok,
11 departing at 2125, 9:25 in the evening, from Heathrow.

12 There were 19 crew, 389 passengers and the
13 resultant aircraft weight was 376.4 tons, which in
14 context is around 95 percent of the max authorized
15 takeoff weight.

16 All of the preflight checks were perfectly
17 normal, which included full and free check of the
18 aircraft flight controls. The aircraft was cleared for
19 its departure exactly two minutes behind another heavy
20 747-400.

21 The takeoff roll and initial climb were
22 uneventful until the aircraft rose at 100 feet above

1 ground level and accelerating through 190 knots, when
2 the aircraft pitched, that is, rotated nose down from
3 its selected 14 degrees nose up to approximately 8
4 degrees nose up with no input from the air crew.

5 The handling pilot, the captain, managed to
6 arrest the pitch down at around 8 degrees and the
7 aircraft continued to climb, albeit at a lesser rate.

8 This anomaly lost it for some 6 to 8 seconds
9 when the aircraft then pitched quite sharply nose up
10 again and began to respond normally to the pilot
11 inputs. The crew elected to climb straight ahead while
12 they tried to rationalize what had occurred and they
13 examined all of the flight deck information available
14 to them. A member of the crew even went back and
15 examined the wing surfaces visually out of the windows
16 and there were no indications anywhere as to the source
17 of this disturbance.

18 They debated the possibility of it being a
19 wake turbulence related event. We've had that phenomena
20 described at some length, as a result of the departing
21 aircraft immediately ahead of them. The wind conditions
22 were straight down the runway. Had there been a

1 vortex, it would be quite possibly have been left in
2 their flight path.

3 Equally, they also considered a possible
4 flight control system malfunction that had been a
5 transient and had now rectified itself. After some
6 discussion and in the absence of any indication of a
7 problem, a continuing problem with the aircraft, they
8 elected to continue with the flight to Bangkok.

9 On arrival in the region of Bangkok, they
10 selected all the configuration changes at a slightly
11 higher height than normal, that's flaps and gear down,
12 to make sure that the aircraft would handle following
13 those changes in a normal manner, and the arrival at
14 Bangkok was without further incident.

15 After landing there was discussion between
16 that crew and the crew that were about to depart with
17 the aircraft and various ground personnel about the
18 event. The aircraft was inspected thoroughly. Flying
19 controls were examined. Flight control indications
20 were examined and functioned and the aircraft checked
21 out normally.

22 The aircraft was equipped with a

1 comprehensive quick access recorder as well as the
2 flight data recorder. The quick access recorder
3 recording in parallel primarily with the flight data
4 recorder but giving more ready access to the
5 parameters. The cassette was removed but had to be
6 flown back to London for replay. It was removed. It
7 was returned to London, but in the meantime the
8 decision was taken to continue to dispatch the aircraft
9 on from Bangkok to some destinations in Australia.

10 The decision was taken to delay landing gear
11 retraction on the departure from Bangkok and the
12 departure was uneventful and the aircraft continued to
13 operate for three to four more sectors without event.

14 The quick access recorder, when it was
15 returned to London, was replayed. And if I could turn
16 to Exhibit 9-Q and Appendix 5, this exhibit is a
17 selection of some of the parameters from the flight
18 data recorder. I apologize that none of the colors
19 project so well.

20 There are three diagrams here, all to a
21 common time base. The top one contains a number of the
22 flight and flight control system parameters. This

1 black line is the radio altimeter, so we start with the
2 aircraft traveling along the runway and up here in this
3 purple color, we have the pilot's control column pitch
4 input. And here in green and red we have the inboard
5 elevators position. And down here, the outboard
6 elevators. There are four elevators on the 747-400 and
7 I'll explain shortly how their function is
8 interrelated.

9 So initially we have right and left inboard
10 elevators performing as one would expect in parallel
11 and responding to the pilot pitch changes which results
12 in the aircraft rotating in pitch and climbing away.
13 We then reach a point where we're just going through
14 100 feet about this point here, where the pilot makes a
15 small pitch correction to hold the aircraft pitch
16 attitude, which is in yellow up here and almost
17 invisible, at around 14 degrees.

18 As he does this, we can see the left and
19 right elevator traces split and one goes way up here,
20 the green one, the inner right elevator, to 15 degrees,
21 its max travel position; whereas the left elevator
22 continues to respond to the pilot's increased demand

1 for a pitch up attitude. The pitch attitude does drop
2 from 13 degrees to 8 degrees in this process.

3 So we can see here that despite the pilot's
4 demands for aircraft nose up, the right elevators are
5 actually gone to the maximum aircraft nose down
6 position. They hold this position for about five
7 seconds and then you can see the position returns to
8 again parallel the position of the left elevator.

9 Significantly, we were to discover this point
10 in time at which the anomaly occurs is coincident with
11 most of the main elements of the landing gear starting
12 to travel from their down position to the up position.
13 Down at the bottom here, lastly, we have the recorded
14 pressures for the four hydraulic systems on the
15 aircraft. Again, unfortunately, the yellow one is
16 almost invisible. But during the gear retraction
17 process, the hydraulic pressure in number four system
18 does drop from a nominal 3,000 psi to around 2,375.
19 Number one system drops as well, but not quite so far.
20 This is as a result of large demands being placed on
21 these two systems to achieve the under-carriage
22 retraction process.

1 Although not recorded and shown here, a
2 parallel feature is that because we're demanding large
3 flow rates from both of these systems, we're also
4 delivering large volumes of hydraulic fluid back into
5 the return system and in parallel with this supply
6 pressure drop there is a return line pressure spike of
7 the order of 250 psi.

8 So fortunately, because we had the recorded
9 data available, we were immediately able to know
10 precisely what was the nature of the event. By this
11 time the aircraft had in fact completed four more
12 sectors through Australia and by coincidence was in
13 fact now back at Bangkok.

14 I'd like to just now show another exhibit
15 which is the elevator system for the Boeing 747 which I
16 think will hopefully help us to further understand what
17 had happened. This appears as Appendix 1 in 9-Q, page
18 34.

19 Again, we have a schematic of the elevator
20 system, the front of the airplane is down here, and
21 here we have the pilot's control columns represented.
22 The structure of the aircraft is left out for

1 simplicity. We at the back of the airplane have four
2 elevators which are attached to the trailing edge of
3 the horizontal stabilizers.

4 The pilot inputs, the two pilot control
5 columns are linked by a torque tube and then transmit
6 motion, the pitch input from the pilot, to move these
7 columns fore and aft to achieve movement of two sets of
8 cables which go back to rotator a common torque tube.
9 Back here, push-pull rods then transmit that motion out
10 to the inboard powered flying control units on the
11 inboard elevators.

12 In the case of the 747-400, movement of an
13 inboard elevator is then slaved and signals the
14 movement of the adjacent outboard elevator. This is a
15 change from the earlier versions of the 747 where
16 movement of the inboard left elevator via a cable
17 system, signaled the movement of the outboard right and
18 the inboard right signaled the movement of the outboard
19 left. This was a design feature to minimize the
20 torsional loads on the rear of the aircraft if two
21 hydraulic systems failed and movement of one inboard
22 elevator was lost.

1 On the 400, as you see, it's linked to the
2 adjacent surface, and that's why we saw on the quick
3 access recorder trace the outboard elevators slaving
4 and following the movement of the inboard.

5 Following analysis of the event it was
6 determined that because the pilot had retained control
7 by use of the left elevators and after the event quite
8 clearly all of this mechanical system was intact, that
9 the source of the problem was focused onto the power
10 flying control unit from the right-hand inboard
11 elevator. It's a unit which in many ways is similar to
12 the rudder unit for the 737 in that it does have an
13 external mechanical system which provides feedback to
14 null out the pilot's input when the selected control
15 position is achieved. And ultimately the input to the
16 unit does arrive at a dual concentric servo valve, not
17 identical but similar in many respects to the unit on
18 the Boeing 737 rudder.

19 Each of the inboard powered flying control
20 units is served by two hydraulic system similar to the
21 737 rudder. Each outboard system here is supplied by a
22 single hydraulic system.

1 Having got the QAR data analyzed, the inboard
2 right power flying control unit was removed from the
3 aircraft, another unit placed on the airplane, and
4 since that time the aircraft has operated without
5 further related defect. The unit was removed and was
6 sent back to Boeing, and eventually Parker, for
7 examination.

8 Do you want me to continue?

9 MR. PHILLIPS: I'll jump in and let you rest
10 your voice just a little bit. Thank you for the
11 description of the event and we'll pick up with the
12 point where you left off there in just a second.

13 In your report which is Exhibit 9-Q, I
14 believe, --

15 THE WITNESS: Yes.

16 MR. PHILLIPS: -- on page 20, section 1.17.5,
17 you specifically mention the Boeing 737 dual concentric
18 servo valve history and a safety recommendation that
19 the NTSB made. Could you briefly describe your -- the
20 purpose for inclusion of this recommendation in this
21 section in your report?

22 THE WITNESS: Yes. If I could backtrack to

1 the analysis of this event which is what led us to
2 include the 737 history, and I'll keep it as brief as I
3 can.

4 The unit was examined at Parker and I think
5 it suffices to say that the unit was tested. It was
6 stripped down and it was examined and basically no
7 anomalies in its test performance or in its visual
8 appearance, none of significance were identified. And
9 Parker produced a report to that effect, detailing in
10 purely a factual way really the examination of the unit
11 and its condition.

12 Boeing, following that, did produce a report
13 which took that basic data, analyzed the event and in
14 synopsis said the most probable cause, the only
15 possible cause that fits the DFDR parameters was a
16 momentary jam at the primary valve to the secondary due
17 to a foreign object when the elevators were directed
18 from about 7 degrees up towards zero degrees when the
19 right hand elevators continued down to full travel.

20 They then went on to explain how that would
21 result in performance of the valve, such as to drive
22 the elevator to the position, as recorded. A number of

1 other comments are made there. I don't think I need
2 detail them now. But the conclusion of that report was
3 to say that the hard evidence of the PCU problem is
4 lost; however, the control system is designed to handle
5 the situation as shown by the DFDR data. The
6 statistics on an inboard elevator hardover due to
7 completely unexplained reasons now becomes 2.43 times
8 10 to the minus 8.

9 This response generated a significant number
10 of questions from the operator and from myself and led
11 to an exchange of correspondence and indeed a meeting
12 at Boeing on the 4th and 5th of March during 1994 of
13 which the NTSB were also represented, when the QAR data
14 and the circumstances surrounding this event were all
15 reexamined.

16 As a result of this, considerable further
17 work by Parker and Boeing resulted in a new
18 interpretation of the problem and what was determined
19 was that clearly for the elevator to have traveled, it
20 did require the dual concentric servo valve to actually
21 port fluid to the RAM of the unit at a time when the
22 pilot input was demonstrably demanding elevator in the

1 opposite direction.

2 It was determined that the only way this
3 could have happen was for the secondary sleeve of the
4 dual concentric servo valve to over-travel in the
5 retract direction to its internal stop while the
6 primary was attempting to counter that by going to its
7 full travel position in the extend direction.

8 A significant amount of analysis determined
9 that if that situation could exist, there was
10 sufficient residual pressure in the RAM of the PFCU to
11 drive the units to the recorded position. That being
12 the case, Boeing set about attempting to define
13 mechanisms by which the secondary sleeve could get
14 driven to the internal stop.

15 Eventually, two mechanisms were postulated;
16 one which involved a series of jams and releases of the
17 primary and secondary and required movements of the
18 flight controls that were not actually -- didn't take
19 place because they were not consistent with the QAR
20 data.

21 So eventually it was determined that the
22 secondary sleeve had in fact been moved by a hydraulic

1 phenomena and that phenomena, the potential for that
2 phenomena was brought about by a change of the
3 hydraulic installation at the back end of the airplane
4 between the early series, classic series 747's and the
5 747-400, in that the linkage cavity on the right
6 inboard elevator PCU -- we'd been shown the linkage
7 cavity on the 737 rudder unit. There is a similar
8 region on the 737-400 unit -- was linked to the number
9 four hydraulic system return on the 747-400, which was
10 a change.

11 The number four system is the system that
12 experiences a 250 psi pressure spike during the landing
13 gear retraction. It was postulated that during the
14 landing gear retraction, this pressure spike had acted
15 on the secondary sleeve. The presence of air in the
16 system due to the maintenance that had been conducted
17 prior to the departure from London allowed a situation
18 where that pressure spike could actually move the
19 secondary sleeve to its internal over-travel position
20 and keep it there for the period of the overpressure in
21 the return line. That's for the period of the major
22 components traveling during the gear retraction

1 process.

2 When gear retraction was complete, that
3 pressure spike disappeared and the influence on the
4 secondary valve was lost and the unit went back to
5 normal function.

6 I've abbreviated as best I can a fairly
7 complicated series of events. I hope not at the expense
8 of its being understood.

9 MR. PHILLIPS: Thank you. You've done an
10 excellent job. Let me try to abbreviate it a little
11 more.

12 A 747 departing Heathrow experienced an
13 uncommanded elevator movement. The initial examination
14 or initial thoughts about the failure were that it
15 could have been a jam of a dual concentric servo valve
16 and loss of control. And in the end it was determined
17 that the secondary spool over-traveled as a result of a
18 hydraulic pressure gradient or fluctuation as a result
19 of the landing gear system retraction mode ultimately
20 caused the event.

21 THE WITNESS: Yes.

22 MR. PHILLIPS: The 747 has how many elevator

1 panels?

2 THE WITNESS: Four.

3 MR. PHILLIPS: And had this event occurred,
4 the very same event, on the 737, what would have been
5 the result?

6 THE WITNESS: I'm sorry. On the 737?

7 MR. PHILLIPS: Let me change that question a
8 little bit. Had the 747 had one elevator panel per
9 side, could you speculate as to what the result would
10 have been?

11 THE WITNESS: In fact, very similar because
12 the fact that the outboard elevator was slaved to the
13 inboard meant that both elevators on the one side did
14 travel to the maximum aircraft nose down position.

15 MR. PHILLIPS: The result to the airplane
16 ultimately was a twisting of the tail, a bending of the
17 tail?

18 THE WITNESS: A very significant twisting of
19 the tail as one elevator tail plane combination was
20 attempting to -- was subject to a force in the
21 downwards direction. On the opposite side of the
22 aircraft the combination was subject to a large force

1 in the upwards direction.

2 MR. PHILLIPS: Did this airplane suffer
3 structural damage as a result of the incident?

4 THE WITNESS: It did not.

5 MR. PHILLIPS: Relating your experiences with
6 the 747 incident to the 737 investigation we're
7 speaking of in these hearings, have you been involved
8 in discussions regarding the 737 dual concentric servo
9 valve?

10 THE WITNESS: Yes, I have. The connection
11 was forged to some extent by the NTSB recommendation
12 following the Chicago event, which we've discussed at
13 some length, in that the recommendation from the NTSB
14 did cover a broader -- if I can find it -- a broader
15 series of units than just those fitted to the Boeing
16 737.

17 In fact, what the recommendation said was
18 that the FAA should conduct a design review of servo
19 valves manufactured by Parker Hannifin having a design
20 similar to the 737 power control unit servo valve that
21 control essential flight control, hydraulic power
22 control units, on transport category airplanes

1 certified by the FAA to determine that the design is
2 not susceptible to inducing flight control malfunctions
3 or reversals due to over travel of the servo slides.

4 On reviewing that, quite clearly the Boeing
5 747 units in the tail plane did fit that description
6 and the incident that we were looking at was in fact
7 due to over travel of a servo slide.

8 MR. PHILLIPS: Have you received any
9 explanation as to why that particular anomaly was not
10 detected in this review?

11 THE WITNESS: Yes. And similar to the
12 testimony that was heard yesterday, Boeing and Parker
13 did review the unit but they were specifically looking
14 for the possibility of reversals and didn't consider
15 secondary sleeve over travel other than in the context
16 of reversals.

17 MR. PHILLIPS: Are you aware of any changes
18 to the 747 design as a result of this incident?

19 THE WITNESS: Yes. We raised a number of
20 recommendations as a result of this incident and one
21 was that the hydraulic connections to the unit be
22 reversed. And in fact, that would be them back into a

1 configuration similar to the classic 747 series of
2 airplanes, which have the same unit effectively as far
3 as the hydraulic elements of it are concerned, and that
4 unit is performed without exhibiting this phenomena for
5 many, many flight hours.

6 So one recommendation was to replumb the
7 hydraulics at the back of the aircraft to the inboard
8 right PFCU for the elevator. And two other
9 recommendations were made to modify the servo valve to
10 reduce the distance between the internal stop and the
11 secondary sleeve in the sleeve retract direction to
12 limit the over travel capability and also to refine the
13 shape of the primary valve because of a condition, if
14 over travel with worse case tolerance was achieved, it
15 was in fact possible to achieve a full pressure
16 blowdown at the elevators under some circumstances.

17 So there was one modification to the airline
18 plumbing and two to the servo valve were recommending.
19 The FAA are in the process of raising an AD to that
20 effect and I know that modification of the plumbing on
21 the airplane has already started. Some airplanes are
22 already converted.

1 MR. PHILLIPS: In regards to the original
2 NTSB recommendation for the valve review, did you make
3 additional recommendations?

4 THE WITNESS: Yes. We've asked that the NTSB
5 reissue that recommendation or restate a recommendation
6 in similar form because we believe the fact that this
7 event could occur after that recommendation had
8 supposedly been satisfied would indicate to us that the
9 intent of the recommendation was not fully interpreted
10 and carried out.

11 MR. PHILLIPS: Thank you.

12 Mr. Chairman, I have no further questions.

13 CHAIRMAN HALL: Do the parties have any
14 questions for this witness?

15 MR. PHILLIPS: I've got one other thing to
16 say. Mr. Jacky has some questions regarding FDR
17 parameters that he'd like to continue with for Mr.
18 King.

19 CHAIRMAN HALL: Mr. Jacky, is this going to
20 be long?

21 MR. JACKY: No. I don't believe so.

22 CHAIRMAN HALL: Okay. Well, let's proceed.

1 MR. JACKY: Good morning, Mr. King.

2 THE WITNESS: Good morning.

3 MR. JACKY: The data that you are showing in
4 Exhibit 9-Q I believe it is, Appendix 5?

5 THE WITNESS: Yes, it is.

6 MR. JACKY: That is quick access recorder
7 data?

8 THE WITNESS: That's correct. Yes.

9 MR. JACKY: Was the flight data recorder
10 pulled from this aircraft?

11 THE WITNESS: No. It wasn't used.

12 MR. JACKY: Could you tell me how many
13 parameters were recorded on the flight data recorder on
14 this airplane?

15 THE WITNESS: Yes. I don't know precisely
16 but it was of the order of 80 analog parameters and 200
17 discretes. And the quick access recorder had something
18 in excess of that, considerably in excess of that.

19 So on this elevator control system, for
20 example, the position of all four elevators was
21 recorded and the pilot control column input was
22 recorded.

1 MR. JACKY: On both the QAR and the FDR?

2 THE WITNESS: Yes.

3 MR. JACKY: In regards to -- well, let me ask
4 you this.

5 Does the CAA in your experience require the
6 same amount of FDR parameters on airplanes as the FAA?

7 THE WITNESS: I think the requirements are
8 broadly similar. I don't know if in detail if they're
9 identical.

10 MR. JACKY: So would you be able to estimate
11 the number of parameters recorded by the accident
12 airplane if it had been registered in the U.K.?

13 THE WITNESS: My understanding is that it
14 would have required I believe 11 parameters.

15 MR. JACKY: Are you aware of any movement
16 within the AAIB or within the -- within the AAIB to
17 recommend the CAA or airlines within the U.K. to record
18 more parameters on their FDR's?

19 THE WITNESS: I don't know whether it's going
20 to be a formal recommendation but our flight recorder
21 personnel sit on the numerous flight recorder panels
22 that there appear to be around the world. And as

1 accident investigators, we're always pushing for as
2 many parameters as we can get with as many recordings
3 per second as we can get. I am aware that there are
4 proposed changes now with the JAA, which the CAA is an
5 integral part of.

6 My understanding is that those new
7 requirements will not improve the situation with
8 respect to the Boeing 737 airplane, for example,
9 because of its primary certification date being back in
10 the late 1960's. It seems to fall before any date for
11 the requirement for improved recorders.

12 CHAIRMAN HALL: Mr. Jacky, if you would find
13 out with British Airways requires the operators. Do
14 you know how many parameters they require, sir?

15 THE WITNESS: British Airways on their Boeing
16 737's carries many, many more than the minimum
17 required. It's of the order of hundreds.

18 CHAIRMAN HALL: And they do that voluntarily?

19 THE WITNESS: That's correct. I think they
20 find that the recording of many of these parameters is
21 useful in monitoring, maintaining and operating the
22 airplane.

1 CHAIRMAN HALL: The government didn't have to
2 come in and tell them to do that. They're doing it on
3 their own?

4 THE WITNESS: That's correct. I think
5 there's a commercial payback for them.

6 CHAIRMAN HALL: Please proceed.

7 MR. JACKY: One final question. Has there
8 ever been consideration within the AAIB or to recommend
9 to the CAA or within the CAA to mandate video recorders
10 or some sort of video recorders on an airplane?

11 THE WITNESS: Yes. We have made
12 recommendations in the past. One was a very broad
13 recommendation after the Manchester fire on a 737 on
14 the ground, which didn't actually mention video
15 recorders, but it did talk in terms of giving flight
16 deck crew a view, an external view of the airplane.

17 And then, following the accident to a Boeing
18 737 in Kegsworth where an engine failure was the
19 initial source of the accident scenario, it was
20 recommended that consideration be given to use of both
21 external and internal video recorders, both to provide
22 crew with information about any emergency or

1 predicament they might find themselves in and also to
2 be a source of recorded data to be used on the analysis
3 post-event by the likes of the NTSB or the AAIB.

4 MR. JACKY: Thank you, Mr. King. I have no
5 further questions.

6 CHAIRMAN HALL: Well, that was good
7 questioning, Mr. Jacky. Thank you. It's an important
8 subject.

9 Now, back to the parties. I saw Boeing's
10 hand. Were there others? ALPA? Anyone else?

11 Okay. Captain, Airline Pilot's Association.

12 CAPTAIN LeGROW: Thank you, Mr. Chairman.

13 Good morning, Mr. King.

14 THE WITNESS: Good morning.

15 CAPTAIN LeGROW: In your testimony you showed
16 us the graph and the flight data recorder readouts or
17 the quick access recorder readouts on the control
18 positions. Could you tell us or speculate on how the
19 investigation would proceed and if in fact you would
20 find the cause of this accident had you not had those
21 parameters to look at?

22 THE WITNESS: It would have been extremely

1 difficult and I think the event -- there's every
2 possibility that the event would have been written off
3 as a wake turbulence event.

4 CAPTAIN LeGROW: Thank you. Also, to follow
5 up on Mr. Jacky's questions, in your opinion, do you
6 think that if the airlines and the manufacturers had
7 the appropriate number of parameters on flight data
8 recorders that video recorders would be necessary or is
9 there enough information from the technology that we
10 have today to record so many parameters, as many as
11 200, I guess. Would that not suffice in accident
12 investigation?

13 THE WITNESS: And increased number of
14 parameters clearly helps. And you're right. On modern
15 aircraft, the more digitized the information becomes on
16 the airplane for the routine operation of the airplane,
17 the more information there is that can be readily
18 recorded. Video, however, can provide additional
19 information about crew activity or other events on the
20 flight deck that would not actually be recorded as part
21 of the data available from the airplane.

22 So what you're saying is that you would be in

1 favor of videotaping the crew's activities?

2 THE WITNESS: Videotaping the flight deck to
3 identify crew activity and cockpit presentations.

4 CAPTAIN LeGROW: On a digital -- on an
5 electronic flight instrument flight panel, as an
6 example, are not all those parameters recordable?

7 THE WITNESS: I'm sure they are, yes. But
8 one of the possibilities would be that the crew were
9 being presented with something actually at the flight
10 deck that had been subtly corrupted from its source
11 to the recorder on the data bus. So if you actually had
12 a video of the flight deck, you would then have
13 absolutely no doubt about what the crew were being
14 presented with, as opposed to the data that was being
15 recorded.

16 CAPTAIN LeGROW: Thank you, Mr. King.

17 I have no further questions, Mr. Chairman.

18 CHAIRMAN HALL: Thank you.

19 Mr. McGrew? The Boeing microphone, please.

20 MR. MCGREW: Good morning, Mr. King.

21 THE WITNESS: Good morning.

22 MR. MCGREW: Are you aware now that there are

1 some significant differences between the 737 PCU and
2 the PCU on the 747?

3 THE WITNESS: Yes, there are.

4 MR. MCGREW: And are you satisfied, based on
5 those observations specifically with respect to the
6 return line that that event is not likely at all on the
7 '37?

8 THE WITNESS: I don't see that hydraulic
9 phenomena on the 737 being available.

10 MR. MCGREW: Thank you.

11 I'm sorry. That's all, Mr. Chairman. Thank
12 you.

13 CHAIRMAN HALL: All right. Any of the other
14 parties have questions for this witness?

15 (No response.)

16 If not, Mr. Marx?

17 MR. MARX: As a result of the incident and
18 the subsequent removal of the PCU, was there any tests
19 that were performed by Boeing to try to duplicate the
20 event?

21 THE WITNESS: Yes. Boeing mounted the unit
22 on their iron bird, their fixed flying controls test

1 rig, put air or another substitute gas into the unit to
2 attempt to simulate the possibility of an aerated
3 hydraulic system due to the maintenance that took place
4 immediately beforehand and tried to reproduce the
5 pressure spikes in the return line and the pilot inputs
6 to the unit.

7 They weren't successful in actually producing
8 a hardover of the controls but did produce what was
9 described as a bumpy or a notchy response of the
10 elevator which was similar to two other airborne events
11 recorded by Quantas. And the interpretation of that is
12 that the hydraulic event is starting to move the
13 secondary sleeve towards the internal retract stop. But
14 before it stabilizes there, the pressure equalizes
15 across the secondary sleeve and it continues to
16 function in its designed fashion.

17 MR. MARX: The first analysis by Boeing that
18 indicated that the primary would jam against the
19 secondary and move the secondary to its internal stops,
20 they also indicated that there was no evidence of any
21 jam at that time.

22 THE WITNESS: That's correct.

1 MR. MARX: The forces that would be required
2 to resist the secondary slide from moving into the
3 internal stops, would that be the spring at the inside?

4 THE WITNESS: Correct.

5 MR. MARX: And approximately, do you know
6 what the resistance of that spring was?

7 THE WITNESS: I don't, but I don't think it's
8 dramatically different to the 737, which is 12 pounds.

9 MR. MARX: Twelve pounds.

10 THE WITNESS: It's of that order, I believe.

11 MR. MARX: Well, so if there was something
12 that did jam in that particular situation, it would be
13 resisted by a 12 pound spring force roughly?

14 THE WITNESS: By the spring force. Yes.

15 MR. MARX: And at this time, Mr. King, are
16 you satisfied that the hydraulic phenomena did occur on
17 this particular incident?

18 THE WITNESS: I think so, because
19 circumstantially the retraction of the landing gear,
20 the pilot input being coincident with the event and the
21 maintenance immediately before the flight potentially
22 could have had an influence. This was the only

1 mechanism that actually brought these various potential
2 situations together to explain the event.

3 If I go back and say, again, that for the
4 PFCU to have run away in the way it did, the servo, the
5 dual concentric servo valve had to be in a position
6 where it was porting fluid to the unit at a time when
7 quite clearly the pilot was demanding an opposite
8 movement and all of the mechanical systems were intact.

9 This really did lead one to the conclusion
10 that the secondary valve over traveling to the internal
11 stop was the only mechanism that could be postulated to
12 achieve that. In the absence of any other explanation
13 as to how it could move, then the hydraulic phenomena
14 is one that, yes, I accommodate.

15 MR. MARX: I just have one final question.
16 Have you completely ruled out the possibility that a
17 secondary -- or primary to secondary jam had occurred
18 to drive it into the internal stops or do you still
19 think there's a possibility that that could occur?

20 THE WITNESS: I can't say that there isn't a
21 possibility. There's no evidence for it and I do have
22 in the hydraulic event an explanation for the phenomena

1 experienced.

2 MR. MARX: Thank you.

3 No further questions.

4 CHAIRMAN HALL: Mr. Clark?

5 MR. CLARK: Mr. King, you described earlier
6 that when the actuator moved that it pulled the other
7 elevator along?

8 THE WITNESS: Yes.

9 MR. CLARK: How can that happen when I have
10 an actuator on each one of those panels and it seems to
11 me they should be opposing.

12 THE WITNESS: The movement of the inboard
13 elevator actually drive a push-pull rod to the input of
14 the outboard elevator.

15 MR. CLARK: So in that sense it's slaved?

16 THE WITNESS: It's slaved directly to it.
17 They behave as one panel, effectively, when all systems
18 are operational.

19 Having said that, that's at low speed. The
20 outboard elevators do, as the 737 rudder, blowback and
21 they start their blowback at a relatively slow speed,
22 138 knots springs to mind. And so at a 190 knots, the

1 outboard elevators are not achieving the same amount of
2 deflection as the inboards.

3 MR. CLARK: In that situations, then, in the
4 737 rudder package we have a feedback mechanism to
5 feedback a null at the control input. The inboard
6 panel on your elevator has that same feedback but the
7 outboard elevator has a feedback mechanism to the
8 inboard?

9 THE WITNESS: No. Both power control units
10 have their own feedback loop: one, the inboard one
11 responding to the direct pilot input or autopilot
12 input; the outboard one responding to an input supplied
13 by the movement of the inboard elevator.

14 MR. CLARK: That's what I meant to say.

15 I have no further questions. Thank you.

16 CHAIRMAN HALL: Mr. Schleede?

17 MR. SCHLEEDE: Yes.

18 Mr. King, could you refer to page 22 of your
19 report quickly there, on the left side there of page
20 22, down at the bottom.

21 You had already testified about the
22 determination regarding the NTSB recommendation and the

1 outcome, but I was curious about the last sentence in
2 that section just before 1.18 where it says, "However,
3 Boeing now maintained that the extreme stop conditions
4 recognized in the mid-1970's." Is that your statement
5 or is that from Boeing?

6 THE WITNESS: That's from Boeing. At the
7 time the report -- excuse me. Under our regulations,
8 before we can make a report of this nature public we're
9 required to provide a draft of the contents to any
10 party whose professional reputation may be deemed to be
11 adversely affected by its contents, is the way it's
12 worded, but in fact, clearly operator, manufacturer and
13 interested parties. And in the original, I can't
14 remember exactly what the wording was, but there was
15 the response from Boeing which said there were no
16 discrepancies uncovered and therefore no actions taken.

17 The extreme stop condition was not envisioned
18 at that time. I put in a comment to the effect that I
19 thought it was strange that it wasn't envisioned
20 because it was secondary sleeve travel to the internal
21 stop, secondary sleeve over travel that was the very
22 thing that drove the NTSB to make the recommendation.

1 A response to Boeing to that draft was to say
2 that, however, they had considered the extreme stop
3 condition in the mid-1970's. So that was a Boeing
4 comment inserted in response to a representation made
5 by them following the distribution of our draft of the
6 report.

7 MR. SCHLEEDE: Did they elaborate on that
8 consideration that they made in the 1970s, what
9 generated it?

10 THE WITNESS: No.

11 MR. SCHLEEDE: Okay. Thank you, on that
12 issue.

13 When you did your investigation of this
14 particular incident, I'm not sure if you were asked.
15 Did you query Boeing for them to search their database
16 for other similar events?

17 THE WITNESS: Yes, we did.

18 MR. SCHLEEDE: And did you come up with any?

19 THE WITNESS: They came up with I think three
20 or four occasions where elevator -- undemanded elevator
21 movement had occurred, but in every case it was
22 explained by a mechanical problem with the linkages for

1 the systems. Something that clearly would have been
2 visible post event had we had anything like that.

3 There was no record, as I recall it, of any
4 such malfunction with all of the mechanical systems
5 being intact post-event.

6 CHAIRMAN HALL: How did you request that
7 information?

8 THE WITNESS: By letter.

9 CHAIRMAN HALL: I mean, did you request it by
10 ATA code or any type of code, or did you just ask for
11 events similar to this?

12 THE WITNESS: We just asked them for all -- I
13 think it was all elevator related events.

14 MR. SCHLEEDE: You mentioned in your report
15 and your testimony a couple of Quantas events. How did
16 you come to know about those? Was that from Boeing?

17 THE WITNESS: No. I believe we heard of
18 those through British Airways and their contacts.

19 MR. SCHLEEDE: And those events were not in
20 the Boeing list that they provided you?

21 THE WITNESS: I don't think at the time they
22 were necessarily understood to be related to this

1 phenomena.

2 MR. SCHLEEDE: I couldn't recall. Was there
3 any QAR or flight recorder data available on those
4 events to analyze?

5 THE WITNESS: None that I was aware of.

6 MR. SCHLEEDE: One of the areas we'd asked
7 you to briefly describe was your involved in a Boeing
8 737 rudder event involving a British Airways aircraft.
9 I believe it was in August of 1994. Could you briefly
10 summarize your knowledge of that event?

11 THE WITNESS: Yes. British Airways had an
12 aircraft that was written up by the flight crew as
13 having airframe vibration and on investigation it was
14 discovered that this was associated with a rudder PFCU,
15 small rudder PFCU outputs, oscillating outputs, which I
16 believe are not uncommon and are generally associated
17 with the input to the yaw damper, problems with the
18 electrical system or wiring in that area.

19 And during the maintenance that followed that
20 write-up, the engineer in troubleshooting the system,
21 for some reason elected to switch off the two flight
22 control hydraulic systems A and B and energy the

1 standby rudder hydraulic system and this resulted in
2 the rudder going hardover.

3 He reinstated the main flight control
4 hydraulics and the rudder then behaved normally. He
5 repeated the process, switched off the A and B
6 hydraulics and again the rudder went hardover. And
7 this led to the removal of the standby rudder actuator
8 which, when it was initially disassembled at British
9 Airways, it was found that the servo valve within that
10 unit was heavily corroded. It was bright orange and
11 rusty and had clearly been seized within the unit for a
12 considerable period of time.

13 MR. SCHLEEDE: So this aircraft -- the defect
14 was noted while the aircraft was in flight?

15 THE WITNESS: The original defect, which was
16 a vibration, which was in fact eventually tracked and
17 confirmed to be a problem generated by the primary
18 rudder PFCU. The standby rudder corroded valve was
19 apparently a totally dormant feature.

20 MR. SCHLEEDE: Dormant you said?

21 THE WITNESS: Dormant. Yes.

22 MR. SCHLEEDE: Did British Airways do a fleet

1 survey to check the other aircraft?

2 THE WITNESS: I don't know about the whole --
3 well, they did a fleet survey inasmuch as yes, they
4 checked the function of all other standby rudder
5 actuators and they removed three high time actuators
6 from their fleet and disassembled them but found
7 nothing approaching the condition of the incident one.

8 MR. SCHLEEDE: One last area. You mentioned
9 in your qualifications that you had worked on the
10 Lockerbie investigation. Did you work on that as an
11 engineer on the reconstruction or examination of the
12 wreckage?

13 THE WITNESS: In a number of capacities in
14 that I was the duty coordinator on that evening, so I
15 received the first notification of the event. And so
16 for the first three or four days, I coordinated our
17 response in mobilization of the teams and getting
18 people on site. After that four days, I then went to
19 the site and coordinated a lot of the field activity,
20 the recovery of the wreckage, the initial two-
21 dimensional reconstruction, which was carried out at a
22 local facility, and I became most directly involved

1 there in reconstruction of the baggage containers.

2 And subsequently we carried a 60 foot section
3 or pieces that represented a 60 foot section of the
4 fuselage which surrounded the area of the bomb down to
5 our facility at Farnborough and there we made a three-
6 dimensional reconstruction.

7 MR. SCHLEEDE: Did you and your staff assist
8 us in the evaluation of the wreckage of Flight 427?

9 THE WITNESS: Yes. I and one of my colleagues
10 went to the hangar at Pittsburgh during the time that
11 the second visit, I think of the Structures Group,
12 where they were attempting to reconstruct specific
13 areas that have been discussed: the forward pressure
14 bulkhead, the floor beams, the wheel well area, the
15 PATS tank, those area. Yes. I was there during that.

16 MR. SCHLEEDE: And did you have someone here
17 during the more than two-week period working on that
18 reconstruction?

19 THE WITNESS: Someone was there throughout
20 that two-week period. I was there for most of it.

21 MR. SCHLEEDE: Could you comment on that just
22 generally? Briefly comment on the effort and results

1 from your experience on the quality of the effort and
2 the results.

3 THE WITNESS: Yes. I think the reason we
4 were asked perhaps -- I mean, we have a history of
5 cooperation so it wasn't a surprise. But I think
6 primarily we were asked because of our experience with
7 Lockerbie, which everybody knows about the
8 reconstruction effort that took place there. The
9 challenge presented by Flight 427 was a much more
10 severe one in terms of attempting the structural
11 reconstruction.

12 Lockerbie had broken up in the air and the
13 pieces had fallen to the ground. 427 had been driven
14 at much higher speed into the ground. Structure was
15 significantly more disintegrated and reminded me much
16 more of a high speed military airplane type impact than
17 the typical civilian wreckage that one sees.

18 As a consequent, just identifying components
19 in the wreckage was extremely difficult. And I think
20 the level of success that was achieved is a testimony
21 to everybody and all of the parties who took part in
22 that process. It was an extremely daunting task which

1 was attacked with great enthusiasm and energy and I
2 think what was achieved was the best that could be
3 achieved given those circumstances.

4 MR. SCHLEEDE: Thank you very much, Mr. King.

5 CHAIRMAN HALL: Mr. Laynor?

6 MR. LAYNOR: Just one, Mr. King.

7 In the 737 standby rudder actuator problem
8 that you describe, was the servo valve screw disengaged
9 from the input crank arm?

10 THE WITNESS: It was, as recovered. Yes.
11 The ball which transmits the drive to the sleeve was
12 sheared off. The metallurgical determination of that
13 determined that that ball had probably been sheared off
14 during the investigation of the event when the engineer
15 selected the standby system and the rudder went
16 hardover. He did try and actually reposition the
17 rudder by heaving on the peddles.

18 Because that fracture was so clean and the
19 area surrounding it was so heavily corroded, it was
20 determined that that ball probably sheared off at that
21 very late stage.

22 MR. LAYNOR: Was there any investigation or

1 follow-up to find out whether the feedback through the
2 standby actuator housing and the crank, input crank and
3 driving linkage was affecting the operation of the main
4 PCU?

5 THE WITNESS: Only inasmuch as there had been
6 no reported problems with the airplane prior to the
7 squawk which led to the maintenance.

8 MR. LAYNOR: Okay. Thank you.

9 CHAIRMAN HALL: Well, Mr. King, I just have -
10 - really some general comments.

11 First of all, I would like to thank you and
12 the Air Accident Investigation Branch of the United
13 Kingdom for your assistance to the National
14 Transportation Safety Board on this investigation.
15 It's obvious that we're very proud of the many products
16 that are manufactured in our country that operate
17 throughout the world, as in your country. And
18 particularly in the aviation area, international
19 cooperation is essential in this day and age.

20 We have a situation now where the particular
21 airline here, USAir, I believe British Airways has some
22 interest in that and maybe they will have some

1 influence in the flight data recorder area with them.
2 And as we get into that, which is one of the Chairman's
3 primary interest, but the reconstruction was extremely
4 difficult and we appreciate you providing your
5 expertise and just expense and cooperation which you
6 have provided.

7 Mr. Schleede tells me he met you in Nairobi
8 in 1974. Is that correct?

9 THE WITNESS: Yes. That's true.

10 CHAIRMAN HALL: And that you were able to
11 find out -- and he wasn't -- the cause of that
12 accident. Is that correct?

13 THE WITNESS: Yes.

14 CHAIRMAN HALL: I wish you'd send me a
15 resume. Would you do that?

16 (Laughter.)

17 Now, seriously, we really appreciate the
18 cooperation. And this cooperation and coordination is
19 something that we see developing throughout the world
20 and we appreciate your presence this morning.

21 You are excused.

22 THE WITNESS: Thank you.

1 (Witness excused.)

2 CHAIRMAN HALL: We would now entertain a
3 break until 11:00 o'clock, at which time the next
4 witness will be called.

5 (Whereupon, a recess was taken.)

6 CHAIRMAN HALL: We will reconvene the hearing
7 and call Mr. Jean McGrew, the Chief Engineer for the
8 Boeing 737 with the Boeing Commercial Airplane Group in
9 Seattle, Washington.

10 (Witness testimony continues on the next
11 page.)

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1 JEAN MCGREW, B-737 CHIEF ENGINEER, BOEING COMMERCIAL
2 AIRPLANE GROUP, SEATTLE, WASHINGTON

3

4 (Whereupon,

5 JEAN MCGREW,

6 was call as a witness by and on behalf of NTSB, and,
7 after having been duly sworn, was examined and
8 testified on his oath as follows:)

9 CHAIRMAN HALL: If I could ask for those
10 individuals who want to come in and observe the
11 proceedings to please come in and take a seat. And if
12 you desire to have conversations, please take those out
13 into the hallway.

14 Mr. McGrew, welcome. Mr. Schleede will begin
15 the questioning.

16 MR. SCHLEEDE: Mr. McGrew, give us your full
17 name and business address for our record?

18 THE WITNESS: My name is Jean Alan McGrew and
19 my address is Boeing Commercial Aircraft Company, P.O.
20 Box 3707, Seattle, Washington 98124.

21 MR. SCHLEEDE: What is your position at
22 Boeing?

1 THE WITNESS: I'm the Chief Project Engineer
2 for the 737's.

3 MR. SCHLEEDE: For the --

4 THE WITNESS: For the 737's.

5 MR. SCHLEEDE: And how long have you worked
6 at Boeing?

7 THE WITNESS: About five years.

8 MR. SCHLEEDE: Could you give us a brief
9 description of your background and education that
10 qualifies you for this position?

11 THE WITNESS: Yes. I have a bachelor of
12 science in aeronautical engineering in 1962 and a
13 master of science in applied mechanics in 1963 from the
14 University of Washington. I have nearly five years of
15 experience in jet fighter work at Northrup,
16 specifically in the area of structural dynamics,
17 flutter and testing, and 21-22 years of experience with
18 the McDonnell-Douglas in Long Beach, California,
19 working all of the Douglas transports with varying
20 levels of responsibility, and before my retirement was
21 the Director of Design Engineering for Douglas.

22 I was for many years the Chief Structural DER

1 for the Douglas Company and I retired there in '89 and
2 came to Boeing.

3 Let's see. I also for many years was a
4 visiting instructor at the University of Southern
5 California in graduate school and taught aero
6 elasticity.

7 MR. SCHLEEDE: Do you hold any FAA ratings or
8 certificates?

9 THE WITNESS: No, I do not.

10 MR. SCHLEEDE: Are you currently a DER at
11 Boeing?

12 THE WITNESS: No, I'm not.

13 MR. SCHLEEDE: Could you briefly describe
14 your responsibilities as the 737 Chief Engineer?

15 THE WITNESS: I am responsible for all of the
16 technical aspects of the 737 fleet. Specifically, the
17 -300, -400 and -500's with some overlap into the
18 earlier -100's and -200's. I'm not responsible for the
19 design of the new 737, the new generation program.

20 My real duties are overseeing change to the
21 airplane and making sure that changes that come about
22 for any reason are technically proper. In addition, I

1 work with the -- to some extent in the sales area and
2 to by and large a great deal with the service and
3 customer engineering people dealing with the operators
4 on the various difficulties or changes that they need.

5 MR. SCHLEEDE: Would it be fair to say that
6 virtually all aspects of operation regarding the 737
7 would be under your area of responsibility?

8 THE WITNESS: For engineering, yes, it would
9 be fair to say that.

10 MR. SCHLEEDE: How about your relationship to
11 customer support?

12 THE WITNESS: That is a separate organization
13 but we deal directly and regularly and daily with them.

14 MR. SCHLEEDE: Thank you.

15 Mr. Phillips, proceed.

16 MR. PHILLIPS: Good morning, Mr. McGrew.

17 Are you responsible for the work products of
18 Mr. Cline and Mr. Turner who testified earlier?

19 THE WITNESS: Yes, I am.

20 MR. PHILLIPS: And Mr. Johnson?

21 THE WITNESS: Not directly responsible for
22 Mr. Johnson, but we do interface.

1 MR. PHILLIPS: Thank you.

2 The first area that I'd like to go into just
3 briefly is earlier testimony this week. We discussed
4 the process used in the USAir 427 accident
5 investigation. Could you briefly give us a synopsis of
6 the support that Boeing has provided to the
7 investigation, both in manpower and facilities?

8 THE WITNESS: Yes. If I could have Exhibit
9 9-U16, please?

10 MR. PHILLIPS: One more question. I was just
11 advised Mr. Kerrigan also works for you?

12 THE WITNESS: He works -- yes. In this
13 accident investigation case he does.

14 MR. PHILLIPS: So virtually every Boeing
15 engineer that's appeared in this hearing is under your
16 supervision?

17 THE WITNESS: With respect to the accident
18 investigation, yes.

19 This describes I think fairly well the effort
20 that Boeing has been putting into this thing. We got
21 started in early September immediately following the
22 accident. My best estimates today, looking through the

1 name lists that people have been charging to this
2 effort is about 95 employees off and on, consisting of
3 about 42,000 hours. That is probably in the area of
4 \$1.5 million or so dollars at this point, I think,
5 including all the testing, traveling, and the various
6 and sundry expenses.

7 We actually have about 23 people working
8 full-time on the program and some of them you have met
9 already.

10 The process we have employed is probably not
11 far different than we do in most engineering
12 approaches. I call it a reactive/proactive program. We
13 react to the suggestions and the requirements of the
14 NTSB and the various parties and we're proactive in the
15 sense that we're continually looking within ourselves
16 for what possible causes could be and the things that
17 we need to do.

18 We feel that we have carried out fully a
19 cooperative and coordinated process with the NTSB and
20 the specific instructions I was given when I was given
21 assignment to be the technical leader of this team were
22 to go out and find the cause and if it's anything to do

1 with the airplane, fix it. And that's what we're
2 trying to do.

3 We followed a process I call of items under
4 consideration. What we've done is continually go
5 through and review all possible causes or events or
6 things that we think could have contributed to the
7 accident. And then, since we have no positive
8 indicators of what it is or not very many, anyway, look
9 at all of those things and try to close them out. And
10 by close them out, I mean establish the evidence and
11 the data that indicates they were or were not a
12 causative factor in this thing. And those that are not
13 we rule out and then march on.

14 As a matter of fact, our list at this point
15 is some 85 items, of which I believe 74 of which we
16 have closed. And when I say closed, they are almost
17 without exception closed by the NTSB, I believe, and
18 the parties, as well.

19 We have carried out a number of tests both in
20 laboratory flight tests and a fair amount of analysis
21 in trying to understand what could have happened to
22 this airplane.

1 MR. PHILLIPS: Do you envision additional
2 work beyond this hearing in support of this
3 investigation?

4 THE WITNESS: I do. I think we haven't asked
5 all of the right questions yet clearly, because if we
6 had -- in my -- a great deal of my job is asking
7 questions of people and making people think. And then
8 generally in this process at least at Boeing in
9 engineering when you've asked, finally asked the right
10 question of the right person with the right group
11 there, you generally come up with the right answer. So
12 in my view, we just haven't asked that question yet.

13 MR. PHILLIPS: As a result of the testimony
14 in this hearing this week, have you identified any
15 areas for additional work?

16 THE WITNESS: Yes and no. I have -- we have
17 some opinions of some additional work that needs to be
18 done. I'm not sure that I've heard anything new that we
19 hadn't already considered.

20 MR. PHILLIPS: I'd like to switch gears here
21 for just a little bit and talk about the process that
22 Mr. Johnson spoke of earlier regarding incident

1 reporting through the Boeing Company.

2 Could you briefly describe the Federal
3 Aviation requirements for reporting of incidents and
4 Boeing's response to that requirement?

5 THE WITNESS: Yes, I can. You're speaking of
6 21.3. And first of all, 21.3 requires the
7 manufacturer, the holder of the type certificate to
8 report to the FAA within 24 hours after the
9 determination of an event that is in the reportable
10 list, which is I believe 15 items. I have a list of
11 them here.

12 The way it generally works in Boeing is that
13 most of those things are obvious when they come in and
14 I would say 99 percent of them come in through customer
15 engineering, as Mr. Johnson indicated, I'm sure. A few
16 of them come in via other sources. Eventually, those
17 items get through to the airworthiness part of our
18 organization, which is part of engineering at Boeing.

19 The airworthiness people then deal with the
20 safety people. And in general, if there's a question,
21 they will deal with me if it's a 737 issue on whether
22 it is a reportable item or no. That is, occasionally

1 items that come in are probably reportable but
2 additional data is required to discern whether it
3 really should be. And that sometimes causes a delay of
4 more than a day. But generally they are then submitted
5 to the FAA.

6 MR. PHILLIPS: As these items are reported
7 and processed through the Boeing Company, could you
8 describe your relationship with Mr. Johnson's
9 organization?

10 THE WITNESS: Well, that 99 percent or so
11 come over to airworthiness from Mr. Johnson's
12 organization, and then the airworthiness organization
13 takes them and includes me in them.

14 In addition, I get regular submittals every
15 day from the service engineering organization on items
16 which may or may not be reportable items but are items
17 of concerns or events which have happened in service
18 that they think should come to my attention.

19 MR. PHILLIPS: In response to the Systems
20 Group request for the listing of the lateral and
21 directional upsets involving the 737 fleet, did you --
22 could you make any comment about the initial review,

1 your observations of that list of 185 events?

2 THE WITNESS: When the NTSB asked for the
3 material, we groaned because we knew it was going to be
4 a very large submission. As a matter of fact, I think
5 the total submission was something on the order of
6 eight inches high of data. But through the process of
7 discussions and agreement on how we would go about it
8 and the timeliness of it, I think we did a relatively
9 complete job.

10 I think we have, since Mr. Johnson was up
11 here, we may have understood why the particular Air
12 France incident you were discussing didn't get on the
13 list and since we used our servs or R&M or Reliability
14 and Maintainability database, that particular item was
15 first triggered from Air France and I seemed to have
16 misplaced the page, but -- ah. Here is it.

17 But apparently, according to this, Air France
18 maintenance engineering reports that there was no known
19 maintenance action due to the relatively small rudder
20 displacement. So in general, that could cause an item
21 to not get into the database.

22 The R&M database is used for a lot of things.

1 One of them is, of course, keeping track of the safety
2 levels of the fleet. The other one, though, is for
3 NTSB and reliability data for us to use both when
4 product improvements are required or just to check
5 against operators who ask questions about how their
6 reliability is versus others and that sort of thing.

7 MR. PHILLIPS: And along those lines, in the
8 investigation of this accident, in reviewing the data
9 there appear to be in my opinion a large number of yaw
10 damper squawks or discrepancies. Could you comment as
11 to whether that's a valid statement on my part?

12 THE WITNESS: It is a valid statement,
13 although we might question the definition of large.

14 If we could have 9-U8, please?

15 There are many components to the rudder
16 control system, but in my view the significant ones
17 related to service difficulties with the yaw dampers,
18 or the ones listed on this list. It's the basic yaw
19 coupler where the rate gyro signal is provided. It is
20 the T valve where the electrical impulses transmitted
21 into a hydraulic impulse and an electrical solenoid
22 which energizes the system and which is on the PCU.

1 Then, of course, the rudder PCU and the
2 standby PCU, that maintenance process down there is
3 meant to mean the process by which we find components
4 that are faulty and it is the normal process. It's the
5 same that you use with your automobile effectively.
6 And that is, when something gives an indication that
7 it's not working properly, which we would call an on
8 condition case, then you go and examine and find it and
9 replace it.

10 The yaw coupler, the T valve and the solenoid
11 have failure rates that are lower than -- or higher --
12 failure rates which are higher than the PCU's. So they
13 are the usual causes of this. But the fact of the
14 matter is that you use these systems for a good many
15 thousands of hours and eventually they will wear out or
16 go faulty and you will have an event.

17 If we look at the next viewgraph, U-9, here
18 is a summary of the yaw damper system and some
19 improvements and changes that I'll show you. The yaw
20 damper malfunction, as you have heard over and over I
21 think in this session, is controllable by the flight
22 crew.

1 It is clear that the flight crew must
2 recognize that they are involved with the yaw damper
3 and there are more than one failure modes with respect
4 to the yaw damper and it can be what's been called a
5 hardover, which is a three degree limitation in the
6 case of the --300, -400 and -500's, or it can be an
7 oscillatory event from time to time which means it
8 appears as a vibration of varying frequencies.

9 In any event, it still can be controlled by
10 disengaging the yaw damper, although we have seen many
11 cases in service where for one reason or another the
12 pilot didn't turn the yaw damper off and continued in
13 flight with the system.

14 Over the years, we've made a number of
15 improvements to the yaw damper and system and I'll show
16 you those. We do see in the data, and I think I have a
17 figure here that will illustrate that, of significant
18 increase in pilot awareness since 1991. Now I frankly
19 can't tell you whether that is because the pilots are
20 more aware of or concerned with a rudder or whether
21 there's something else going on there in service.

22 In other words, if these units are failing

1 faster or not, if that is something that will come out
2 or is coming out of this operation, we will be
3 researching that that's what the bottom line states.

4 The next viewgraph, though, kind of takes us
5 through the history of the yaw damper system on the
6 737. It was originally designed in 1968 and it had a
7 single channel damper but it was a dualized rudder
8 package. There were actually two yaw command systems
9 on it and it could be selected mainly by the pilot.
10 And that was four degree authority system. That was
11 found to be more than was necessary for the aircraft
12 and it turned out in one of the improvement programs
13 that two degrees would do the job.

14 In '74, then, it was simplified to a single
15 channel system with using only the B system, and then
16 in '79 there was another update which was just to bring
17 it to some current technology. And frankly, there was
18 some cost savings associated with that.

19 In 1984, subject to some concerns on ride
20 quality in the airplane, let me explain very briefly.
21 You've heard about the Dutch roll mode several times.
22 That's -- what that is is a mode of the aircraft that

1 tends to rotate about a point off in space and it's a
2 roll and a yaw simultaneously so the ride in the back
3 of the airplane is more uncomfortable say than the ride
4 in the nose of the airplane. And there was a program
5 to augment the yaw damper system so that the ride was
6 improved somewhat in turbulence. And that was a
7 successful program and three degrees, then, was the
8 authority of the system.

9 Then there were a couple of other reliability
10 improvements in '85 and '87, and the most recent one,
11 which was made in '92 and hasn't received much
12 attention and probably, frankly, is not much in the
13 fleet yet, was an improvement in the pin engagement.
14 You've heard of some incidences, the Continental San
15 Pedro Sula is an example where intermittent or faulty
16 yaw damper operation came about because moisture seeped
17 into that solenoid. And so we've improved the
18 connections there.

19 If you look at the next viewgraph, this is a
20 quick run, and I cannot guarantee that these numbers
21 are precise because it was done very recently when I
22 realized that we needed some of these data, of the yaw

1 damper events as we have them from 1980 through 1994.
2 And we won't spend any time on that but you can see
3 that in 1991 through 1994 there is a significant
4 increase in the number of reported events.

5 And frankly, it is our experience that we do
6 not get all of the reports of such events. The
7 domestic operators provide a great deal or most of the
8 data and some of the foreign ones, but we don't I think
9 get reports from all of the foreign operators.

10 The next figure --

11 MR. PHILLIPS: Could I jump in right here
12 while we've still got this slide up? I guess with the
13 improvements that were shown in the preceding graphs or
14 pages you would expect that number to start decreasing
15 here sometime in the future?

16 THE WITNESS: Yes. That's why I asked for
17 the data. I expected to see -- well, can we go to the
18 next figure?

19 MR. PHILLIPS: Certainly can.

20 THE WITNESS: What we will see here in the
21 next figure is partially what I expected to see, but
22 not totally. This is a plot of -- and this one is

1 normalized to a million -- per million departures, so
2 that's a million flights of the aircraft. And this is
3 the failure rate, which is just the number of failures
4 in the year of concern divided by the millions of miles
5 that were flown in that particular year.

6 As you can see, as you would expect, when the
7 airplane is quite new you tend to get more failures for
8 two reasons. One is the fleet is small and the other
9 is -- so the denominator in the calculation is smaller,
10 and the other reason is that it is not uncommon to have
11 some bugs and go through an improvement process in any
12 such system.

13 But as you can see as we move out into 1984,
14 in 1986 we had a rash of incidents and I was not aware
15 of this, but we will go back and research what happened
16 there. And then it started to drop off and then took
17 off in the early '90s and up into '94.

18 So while the number is frankly not a large
19 number of failures in terms of a rate, it's change is
20 somewhat disconcerting.

21 If you look at the data on the next figure,
22 it is the same data, but we're looking at per million

1 flight hours, which is probably a better measure for
2 this unit, since the yaw damper operates each hour in
3 flight and it is turbulence dependent. So rather than
4 be cycle or departure dependent, these things tend to
5 be hourly dependent. And you can see, however, that the
6 same trend is there.

7 VOICE: [Off mike.]

8 THE WITNESS: That's flight hours. Yes.

9 VOICE: [Off mike.]

10 THE WITNESS: Well, in true keeping with
11 bureaucratic organizations, I have found the person to
12 blame.

13 MR. PHILLIPS: Okay. During the testimony in
14 the hearing this week we've heard reference to the
15 fleet size. I think we've heard that USAir has
16 approximately 235 737's. Could you characterize the
17 size of the fleet for us and give us a little bit of a
18 feeling how widely distributed this airplane is?

19 THE WITNESS: Oh, I would be very pleased to.
20 If we could have 9-U1, please?

21 Mr. Chairman, I must apologize. I misspoke
22 earlier today. It's not 95 customers it's 250

1 customers in 95 countries. I should have realized that
2 was too small. But these are some summary facts on the
3 737 fleet.

4 Now, these include both the -- all 737's
5 built to date. There've been over 2600 of them
6 delivered. We've actually flown 4.2 billion passengers
7 in the 27 years of operation and just a matter of
8 interest, that is over half of the world's population.
9 So half of you have flown on a 737. There's almost 63
10 million flight hours through 1994 and 56 million
11 flights, far above any other transport aircraft.

12 Next chart, please.

13 The original 737-100 and shortly followed by
14 the -200's which is a somewhat larger version of it,
15 was certified and first started deliveries in '67. It
16 wasn't really a -- that should be '69. There was not a
17 lot of action until 1970. The -300, however, was a
18 significantly upgraded and modified airplane with
19 considerably performance and somewhat larger. And that
20 was first delivered in '84.

21 The -400, which is a long-range and
22 considerably larger capacity airplane was delivered in

1 '88, and then the -500, which is a shorter version of
2 the -300, was delivered in 1990.

3 Currently there's over 1,000 737-100's and -
4 200's flying in the world and 1525 currently of the -
5 300, -400 and -500 in the world. So there's over 2500
6 active, 2600 active aircraft in the fleet.

7 Next chart, please.

8 I'd like to talk for just a minute about the
9 safety and the reliability record of the airplane,
10 because that is significant. And I will show you the
11 data. But the -300, -400 and -500 fleet has the best
12 transport reliability dispatch in the world. What that
13 says is when you go into the airport, your chances of
14 getting away on time are the best if you fly on a 737.

15 It also has one of the best safety records of
16 all transport records. As a matter of fact, it had the
17 best safety record in the world for transport aircraft
18 under 200,000 pounds up until the 427 accident and a
19 Turkish accident that happened at the end of the year,
20 a cargo airplane.

21 The next chart just gives you an idea of how
22 the relative aircraft of the world match up in terms of

1 safety. And these bars represent a whole loss accident
2 rate. A whole loss is defined as an accident where the
3 aircraft is effectively ruined. And the 737 fleet is
4 circled down below. It's accident rate is about .62
5 accidents per million departures.

6 Now actually the best aircraft in the world
7 is the 757, which has a zero. And the best in the
8 small right now at this moment is the MD-80, followed
9 by the 737, -300, -400 and -500.

10 Suffice to say that is a good safety record.
11 We would like it to be better.

12 The next chart is -- the NTSB may accuse me
13 of trying to sell 737's here, but it just gives the
14 reliability data for the various aircraft. These
15 numbers, the safety numbers, are worked up by the
16 Boeing people and are based upon public data of
17 accidents.

18 The schedule reliability data is provided by
19 the manufacturers themselves and as you see, the 737 is
20 tops, but there are other aircraft approaching it. And
21 as a matter of fact, ours is up to -- or the '37 is up
22 to 99.4 right now.

1 MR. PHILLIPS: Thank you.

2 I guess these numbers certainly indicate to
3 me that there's a large fleet of aircraft, 737 aircraft
4 flying. There's a large database of fleet experience.
5 And I think that's part of the emphasis or thrust of
6 the testimony this week is that we are talking about a
7 large number of aircraft and any problem or perceived
8 problem with the aircraft affects a lot of people, a
9 lot of operators.

10 I'm aware that Boeing is in the process of
11 early initial design of a new 737 series aircraft. And
12 if you could, I'd like for you to briefly describe the
13 differences in that aircraft from the -300, -400, -500
14 series.

15 THE WITNESS: That aircraft started off being
16 a derivative with an improvement in the engine and a
17 new wing to increase its performance and a few other
18 things. It has grown to be, I would judge, 70 to 75
19 percent all new. It will have much higher altitude
20 capability. It will be a 41,000 foot airplane. It
21 will have significantly reduced maintenance costs in
22 terms of how it is assembled and put together and the

1 systems will be much more user friendly than the
2 existing ones, not that the existing ones are
3 deficient, clearly, based on its dispatch reliability
4 record.

5 And at this date there will be two versions
6 of that for sure and possibly three. They will be the
7 equivalents of the -300, -400 and -500. The first one
8 is called the -700. It is effectively a -300 with all
9 of those improvements.

10 The cockpit stays about the same, but other
11 than that, -- and many of the systems stay very
12 similar. But other than that it's a significant
13 change.

14 MR. PHILLIPS: Are the flight control systems
15 significantly different?

16 THE WITNESS: No, they are not. There will
17 be some modifications and changes because the airplane
18 is getting larger and that requires more hydraulic
19 capability and control forces and that sort of thing.
20 But basically, the control system is not changing
21 significantly.

22 MR. PHILLIPS: In the process of your

1 participation in the investigation of the Colorado
2 Springs accident and the USAir Flight 427 accident,
3 have you specifically made or are planning to make any
4 design changes to the airplane.

5 THE WITNESS: Not based on those accidents
6 themselves but that will change if indeed we do find a
7 difficulty with the airplane.

8 MR. PHILLIPS: And one final area of
9 questioning concerning the database that Chairman Hall
10 and Mr. Johnson spoke of earlier. And we may have
11 heard earlier testimony, but I'd like for you one more
12 time to clarify what process are you and your engineer
13 staff made aware of changes that would be required to
14 the system. And along with that, I'd like some kind of
15 a description of whether an assessment to the safety of
16 continued flight is made and by whom.

17 THE WITNESS: Okay. As I stated earlier,
18 most of the data comes into Boeing from service areas,
19 through servicing engineering or customer support. I
20 think their number they use is around 100,000 report
21 every year. Now that's all reports. That's an
22 operator calling in and saying I need a new wing to an

1 operator calling in and saying I've had a difficulty
2 with the yaw damper.

3 There are other sources than just the
4 airlines and some of that goes into the database in
5 service engineering and some of it goes to the other
6 ones. Service engineering then sends that data over to
7 the R&M people, as well as to people like myself, as
8 well as the design engineers. I think you heard Paul
9 Cline yesterday talk about getting the reports.
10 There's a standard format that is used that describes
11 the event, all the particulars that they have at that
12 time. And effectively, that first report just alerts
13 people that something has happened. And the
14 significance of it is generally very clear.

15 Those reports then are turned into numbers by
16 the R&M people, which are provided to people like me to
17 give us trends in terms of is there something coming.

18 We hold an annual -- a monthly safety review
19 board meeting as part of our overall safety process,
20 and anything that has come up that has any possibility
21 of being a safety item is put on the agenda there and
22 is reviewed by the safety people, as well as the

1 cognizant chief design engineers and myself and my
2 equivalents.

3 We also have what we call a chief project
4 engineer's meeting, which is all of the chief project
5 engineers of the company meet on a biweekly basis and
6 review those items which are significant, both from a
7 safety standpoint or from a design standpoint in
8 general.

9 I would say frankly that the data passing
10 system in Boeing is very, very good compared to some
11 that I have seen in other places. That doesn't mean
12 that things don't fall in the crack from time to time,
13 but not often.

14 In any event, when the data indicates that a
15 change is required, and that also could be just a
16 change requested by a customer, for example, then the
17 design process is generally kicked off, if it's a
18 significant change, in my office and is coordinated
19 through that process. Small changes that a customer
20 might request, for example, I would never see. They
21 would go directly to the functional organization
22 responsible for that.

1 Some problem with corrosion, with a part of
2 the airplane, would generally go through service
3 engineering directly to structures and they would look
4 at it and determine that the temper of the material
5 needs to be changed for that part and they would just
6 do that automatically.

7 MR. PHILLIPS: You described a project
8 engineers meeting. That brings to mind the question.
9 Have other engineers within Boeing outside the 737 or
10 the Renton Group been involved in your work in the
11 investigation of this accident?

12 THE WITNESS: Oh, we get a lot of help both
13 from other management from other parts of the
14 organization, as well as some retired vice presidents.
15 But we also have some engineers in the specialty areas
16 that have come over. One very senior fellow from the
17 747 has come over and spent a good deal of time
18 overlooking what we're doing, at our request.

19 So, yes. When events of this magnitude
20 occur, it is very well known within the company.

21 MR. PHILLIPS: And as a final area of
22 questioning, I would like to know if you have any

1 specific or definite plans for additional testing
2 within the Boeing Company, either flight testing,
3 component testing, --

4 THE WITNESS: Yes.

5 MR. PHILLIPS: -- functional system testing?

6 THE WITNESS: We, with the NTSB obviously,
7 and the parties, are very much are urging all to carry
8 out a flight test with an instrumented '37 behind a
9 '27. We think we need some flight test data to confirm
10 the simulator.

11 I don't know that we'll need any more flight
12 testing of a '37 itself. You have some and you have
13 some of the data and I think you'll get the rest of it
14 to that extent.

15 I've forgotten what the other ones were.

16 MR. PHILLIPS: Any system testing of the
17 rudder system or yaw damper system, functional testing,
18 flight testing?

19 THE WITNESS: I think -- I do not think that
20 that is necessary. We will be looking, as I indicated
21 earlier, at some improvements in that area but -- let's
22 see. One thing I would like to add to the record,

1 though, that I neglected to.

2 In this review process and data process for
3 looking for difficulties, I forgot to mention a very
4 significant part of that, and that is a system in place
5 or process in placed called service related problems.
6 Not the best choice of words, but what that is is a
7 process established at Boeing for formally catching
8 problems when they first come in and recognize them as
9 potential problems and then when the data indicates
10 that they are a significant difficulty either from a
11 safety standpoint, which is almost immediate, or from
12 an economic standpoint.

13 They go into the SRP process and become a
14 formally reported tracked and special groups assigned
15 to work that specific problem as their primary area of
16 responsibility. It is our process to be more
17 responsive to the customer in fixing things that he
18 needs fixed, as well as covering safety items in a very
19 judicious and rapid way.

20 So, anything major that would come in in
21 terms of a potential change would come in through and
22 be part of that SRP process. Right now we do not have

1 an SRP on this particular crash. That's been set up
2 and handled by a special team.

3 MR. PHILLIPS: I have no additional questions
4 at this time unless you'd like to add something I've
5 omitted.

6 THE WITNESS: Nothing that you've omitted,
7 but I would like to make a couple of comments about
8 what you've heard so far.

9 I've prepared a summary of what all of the
10 data is that we have generated. We, being Boeing and
11 the parties. The only data generated, I believe, that
12 didn't involve the parties was the contamination data.
13 And what we see today is that the 427 PCU was not a
14 reversible PCU. We see that the testing showed us that
15 the yaw damper in that unit was limited to plus or
16 minus three degrees, and we see that the unit was not
17 contaminated significantly, and certainly not anywhere
18 to the extent of the contamination test that we ran.
19 And we think that could not be a causative agent.

20 We found that the standby unit was free to
21 rotate and that therefore, the binding that can cause
22 an interaction between the control input and the torque

1 tube and the PCU that would cause a further motion of
2 the rudder more than intended would not be the case.

3 And significantly enough, we've not found any
4 physical evidence of a jam. We think that the jam that
5 has been talked about greatly in the last day or so,
6 the double jam and then losing or freeing up one of the
7 jams -- I'd call it a three-part jam -- is a very
8 improbable event and we have no evidence of that.

9 And much to my pleasant surprise, because I
10 was very concerned about this, we found that the
11 residual pressure levels were on the low side below
12 what some thought that they might be, and on the high
13 side that they were still reasonable and controllable.

14 And that leads us to -- based on that data,
15 to think that the rudder was doing what it was asked to
16 be doing and not what -- it was not an uncommanded
17 event.

18 MR. PHILLIPS: So would it be safe to say
19 that these are conclusions on the part of yourself and
20 Boeing and don't necessarily represent the positions of
21 all the parties or the NTSB?

22 THE WITNESS: That would be very fair to say.

1 MR. PHILLIPS: One other thing that I failed
2 to bring up and would like to have you comment on is
3 your position as the Chief Project Engineer for the
4 737, on an area of interest to the Chairman, additional
5 flight data recorder parameters.

6 THE WITNESS: Yes. I believe we need more
7 flight data recorder parameters. And even more
8 important or as important we need better, higher sample
9 rates. Some of the data that you saw in the data
10 reduction process by Mr. Kerrigan and his people, you
11 saw oscillations in the data. It is very difficult
12 with low sample rates in today's recorders to tell
13 whether that is an event of some high frequency or
14 whether it is corruption -- we call it corruption, but
15 confusion of the system because of the low sample rate.

16 If you recall the flight data recorder traces
17 that we all saw, they show in the airspeed up there
18 very early in the event the two little bumps. But
19 really what you see is the fact that that recorder only
20 records that pressure data every second. So you saw
21 the peak of the air pressure at those seconds when it
22 happens to record it.

1 Now in actual fact, those speed bumps could
2 have been much, much higher or much, much lower. Well,
3 they couldn't be lower but they could be much, much
4 higher than that because the recorder didn't happen to
5 take its data right when the peak occurred.

6 That's happening all over our data recorders,
7 so we need better sample rates.

8 MR. PHILLIPS: So based on your experience
9 and your position, would you believe that we would be
10 here discussing these areas in the detail we have this
11 week had we had additional flight data parameters for
12 this accident airplane?

13 THE WITNESS: I believe that we would be here
14 discussing the event and what we found, but I think we
15 would have some much more definitive ideas of what
16 caused this.

17 MR. PHILLIPS: I have no further questions.

18 CHAIRMAN HALL: Before I go to the parties,
19 let me just ask, Mr. McGrew, do you feel you have
20 exhausted everything in this investigation of the
21 rudder or are there other areas that you would suggest
22 that Board or the parties look at?

1 THE WITNESS: I have to say that we can't
2 have exhausted it because we don't have the answer.
3 And so, yes, we need to push on and continue to look
4 because it's there somewhere.

5 CHAIRMAN HALL: All right.

6 Questions from the parties?

7 I see a hand from Boeing, from ALPA. I do
8 not see any other hands, so we'll first go to the
9 Captain with the Airline Pilots Association, Captain
10 LeGrow.

11 CAPTAIN LeGROW: Thank you, Mr. Chairman.

12 Good morning, Mr. McGrew. Just a few
13 questions.

14 If an operator has an operational complaint
15 that comes from a pilot's squawk on an airplane, does a
16 pilot oriented Boeing representative have any input
17 into resolving that squawk?

18 THE WITNESS: It depends upon the squawk. If
19 it's a pilot related type squawk, something to do with
20 the operation of the airplane or the piloting of the
21 airplane, the answer is yes.

22 CAPTAIN LeGROW: So in your staff or whomever

1 would receive that squawk, you do have pilot oriented
2 test pilot engineers or test pilots that would get
3 involved in that?

4 THE WITNESS: Yes. In the same way that we
5 receive data when it comes in through the service
6 engineering organization, so do the test pilots when
7 they see it is related to that area.

8 CAPTAIN LeGROW: On the graph that you put up
9 on the yaw damper failures, could you define what a
10 failure is? I mean, I'm assuming that it wasn't a yaw
11 damper squawk or a yaw damper situation. Could you
12 define what a failure is to us, please?

13 THE WITNESS: Yes. And I can. And the data
14 is mixed because it consists of both reports of yaw
15 damper events, but it also includes those cases where a
16 report was made but no action was taken for some
17 reason. So it is somewhat corrupted in that sense, but
18 in general, the majority of them are cases where
19 maintenance action was taken and something was changed
20 out.

21 We have made an attempt, by the way, to
22 filter out that. In other words, some of our

1 databases, the R&M databases are very, very good
2 because we tie directly into an airline's data with
3 their permission. And in those cases, we get
4 everything and we get it in a very timely fashion, as
5 timely as the airport gets it, and we can go in and
6 look and find those kinds of things, like cases where
7 yaw damper kicked or the pilot reported it but nothing
8 was found and nothing was done and so we can remove it.

9 When we do that, and we have for one large
10 airline and normalize it, that curve levels out
11 somewhat but it still does show an increase.

12 CAPTAIN LeGROW: Thank you. And what
13 guidance, if any, does Boeing give in its flight manual
14 to flight crews on yaw damper or yaw events?

15 THE WITNESS: In the approved flight manual
16 which has been out for many years, turn off the yaw
17 damper has always been there. Air France brought to
18 our attention that last year, I think, mid year or so,
19 that in the operations manual that that was not in the
20 operations manual, so we updated the operations manual
21 and the airlines have done such.

22 The approved flight manual is the legal

1 document that drives that, but we understand that the
2 operations manual is more practically used. So we were
3 amiss in not catching that a number of years ago.

4 CAPTAIN LeGROW: Could you just tell me when
5 that was installed in the operations manual?

6 THE WITNESS: In the operations manual?

7 CAPTAIN LeGROW: Yes, sir.

8 THE WITNESS: I believe it was September or
9 so that it came out. It was the last printing of last
10 year of the --

11 CAPTAIN LeGROW: It was post-accident, post-
12 427 accident?

13 THE WITNESS: I believe so.

14 CAPTAIN LeGROW: Does December '94 ring a
15 bell?

16 THE WITNESS: Actually I was thinking
17 November but it's in that time frame.

18 CAPTAIN LeGROW: Thank you.

19 Could you tell us when the Boeing 737 first
20 went into service in 1969 if there was a time limit on
21 the rudder PCU on the original airplane?

22 THE WITNESS: I can't tell you that with

1 knowledge. I can give you an opinion, and that is it
2 did not, would not have, in terms of hard time limit on
3 removal.

4 CAPTAIN LeGROW: It did not have a 15,000
5 hour limit when it was originally designed?

6 THE WITNESS: I'm sorry. I can't answer
7 that.

8 CAPTAIN LeGROW: Thank you.

9 It's my understanding -- correct me if I'm
10 wrong, but the Boeing 737-300, -400 and -500 all use
11 the same rudder PCU. Is that correct?

12 THE WITNESS: That's correct.

13 CAPTAIN LeGROW: Could you tell me if on the
14 -700 there's a change or there is a proposed change in
15 the rudder PCU?

16 THE WITNESS: There's a sizable change. It
17 is -- a larger PCU is required.

18 CAPTAIN LeGROW: Could you tell me why it was
19 -- is it the same basic design?

20 THE WITNESS: Yes.

21 CAPTAIN LeGROW: And is that produced by
22 Parker Hannifin also?

1 THE WITNESS: Yes. I'm sure it is.

2 CAPTAIN LeGROW: Does that rudder PCU on the
3 -700 have a walking beam?

4 THE WITNESS: I don't know. I presume it
5 would, but I do not know.

6 CAPTAIN LeGROW: If the parties to the
7 investigation were to recommend additional flight
8 tests, would you endorse that?

9 THE WITNESS: Yes, if it made sense. Yes, we
10 would.

11 CAPTAIN LeGROW: And based on the testimony
12 we heard here this morning on the 747-400 incident in
13 Great Britain, and from the findings that Mr. King put
14 forward here, would it be a true statement that parts
15 of the hydraulic system are still not fully understood?
16 Would that be a fair statement?

17 THE WITNESS: I hope not and I think not.
18 You're speaking of the '37, I presume.

19 CAPTAIN LeGROW: I'm talking about dual
20 concentric valves in general, I guess, not necessarily
21 the -300.

22 THE WITNESS: I believe that we understand

1 that valve and how it works.

2 CAPTAIN LeGROW: Thank you, Mr. Chairman. I
3 have no further questions.

4 CHAIRMAN HALL: Mr. Purvis, with the Boeing
5 Corporation.

6 MR. PURVIS: Our prior witness, Mr. King,
7 testified about an event on an elevator event with the
8 747. Would you please expand on why the 747 split
9 elevator incident failure mode is not applicable to the
10 737?

11 THE WITNESS: Certainly. Let's see.
12 Contrary to one of the papers I say I am not a controls
13 engineer, so I understand them in concept and to a
14 certain extent mathematically, but not in great detail.
15 But in this issue, the '37 PCU -- valve, rather, has a
16 path back from the aft end of the valve to the forward
17 end of the valve that tends to equalize the pressure.
18 And this is my description of it. In the case of the
19 '47 we had a very low pressure area at the far end of
20 the valve and then a high and a low return pressure
21 from the demands of the other system, and then a high
22 pressure input to the valve on a command which slid the

1 valve hardover into the reversing position.

2 Since we have a pressure equalizing line in
3 the basic '37 valve, I think that that situation could
4 not occur. Also, there was an error issue with respect
5 to the maintenance in the '47 and I think that can't
6 happen because of that line in the '37 valve, as well.

7 MR. PURVIS: Thank you.

8 I have no more questions.

9 CHAIRMAN HALL: What's that, sir?

10 MR. PURVIS: No questions.

11 CHAIRMAN HALL: Oh, I'm sorry. I didn't hear
12 you, Mr. Purvis.

13 Very well. We'll move to Mr. Marx.

14 MR. MARX: I have no questions.

15 CHAIRMAN HALL: Mr. Clark?

16 MR. CLARK: Mr. McGrew, are you aware or do
17 you know what Boeing's policy is for outfitting their
18 planes with flight data recorder parameters?

19 THE WITNESS: Effectively, we provide what
20 the customer asks for or requires.

21 MR. CLARK: Provide the minimum requirement
22 plus whatever the customer may request? I mean, there

1 are certain minimum regulatory requirements.

2 THE WITNESS: Yes. The legal requirement,
3 the FARS, yes.

4 MR. CLARK: Are you aware of typically how
5 many parameters go out on airplanes destined for the
6 United States or how many parameters may be on --
7 typically may be on airplanes destined for Europe?

8 THE WITNESS: I don't know what all the
9 numbers are on the European ones. I know that a
10 domestic minimum is a 31 parameters. It think it's
11 list B>

12 MR. CLARK: And typically those airplanes go
13 out with 31 and no more?

14 THE WITNESS: Oh, yes. Well, I think they
15 legally have to go out with that list.

16 MR. CLARK: Well, they go out with 31 by
17 requirement but the operators are not upgrading
18 voluntarily?

19 THE WITNESS: I'm sorry?

20 MR. CLARK: The operators are not putting
21 additional parameters on?

22 THE WITNESS: Well, some do. Some do, yes.

1 MR. CLARK: Are you aware that McDonnell-
2 Douglas routinely loads up their MD-11 airplanes and
3 their MD-80's far beyond the minimum requirement and
4 the customer takes it or leaves it?

5 THE WITNESS: I am aware of that.

6 MR. CLARK: Or takes it?

7 THE WITNESS: I believe -- yes.

8 MR. CLARK: Is there any reason that Boeing
9 could not adopt that same position?

10 THE WITNESS: There is a group of young Turks
11 in the organization -- I consider myself one of them --
12 who are trying to move Boeing to that position.

13 MR. CLARK: Are there any operational
14 problems that you may be aware of from an FAA
15 standpoint? For example, if you have extra parameters
16 on your airplane and they may become unoperational, do
17 we run into MEL problems?

18 THE WITNESS: Well, that, of course, is
19 always the concern from an economic standpoint of
20 difficulties there. But it's not clear to me, based on
21 the experience of some of the operators who are
22 carrying considerably more than that has been a major

1 item.

2 MR. CLARK: That's something if we could get
3 a higher voluntary compliance we should pursue with the
4 FAA not to put airplanes on the ground because of
5 parameters not working that may not be required? I
6 mean, that's a --

7 THE WITNESS: I think that's something that
8 needs to be reviewed, but, of course, one needs to
9 define which parameters are on the list and which are
10 not.

11 MR. CLARK: You mentioned earlier that there
12 are --

13 CHAIRMAN HALL: In that regard -- excuse me,
14 John.

15 Do you think you could tell us and advise us
16 from Boeing's standpoint what type of parameters that
17 you would need to have for a thorough investigation of
18 accidents?

19 THE WITNESS: Yes. We can do that.

20 CHAIRMAN HALL: When I get to my part, I
21 think I'll try and follow up on that, then.

22 THE WITNESS: Yes, sir.

1 MR. CLARK: I think you mentioned earlier
2 that there are some anticipated design changes in this
3 rudder package. Would you identify what those are at
4 this time?

5 THE WITNESS: Well, at this time the specific
6 one that we're going to look at is some improvements in
7 the yaw damper reliability.

8 MR. CLARK: Okay.

9 THE WITNESS: But I do not see, based on what
10 we know today, changes in the basic PCU, if that's what
11 you -- oh, I'm sorry. We are going to look very hard
12 at the standby in terms of eliminating the possibility
13 of the galling issue.

14 MR. CLARK: At this time you don't anticipate
15 changes in the servo valve, for example, or the walking
16 beam breakout unit? Any of that?

17 THE WITNESS: No.

18 MR. CLARK: I have no further questions.
19 Thank you.

20 CHAIRMAN HALL: Mr. Schleede?

21 MR. SCHLEEDE: Yes.

22 Mr. McGrew, in your closing summary there,

1 you mentioned that there's no evidence of a jam in the
2 rudder package from 427, and I now realize that we've
3 done some testing just recently, shear chip testing, to
4 validate what occurs. And those tests, in general,
5 resulted in leaving hard marks.

6 I asked earlier witnesses about a Boeing
7 telex that's an Exhibit 9-AD, Alpha, Delta. It's a
8 telex responding to a request in connection with a 747.
9 Are you aware of that particular thing?

10 THE WITNESS: Uh-huh.

11 MR. SCHLEEDE: And you're aware there was a
12 reply in there on page 6, Item 6, about a request why,
13 if Boeing at that time -- and I know they changed their
14 mind -- thought this was a jam, why there were no
15 marks. And the reply in general was that intention
16 drive tests previously done at Boeing revealed no marks
17 with hard materials and chrome.

18 Can you help us resolve this discrepancy?

19 THE WITNESS: Yes. I can help you and I will
20 help you, but I can't tell you. I think I know what
21 happened. I was unable to get ahold of the people in
22 Everett who put that out yesterday, and so I will have

1 to tell you that I will, if you will allow me, help you
2 by giving you a report on that.

3 I believe that that was written by somebody
4 who did not have all of the facts, but I don't know
5 that. But we will tell you exactly what happened. And
6 if that is the view of the people in Everett, we will
7 tell you that.

8 MR. SCHLEEDE: And I recall during our
9 meeting in December in Seattle that there was a
10 statement that there had been no previous testing and
11 there was some Air Force testing. I would very much
12 appreciate if we could get these data, because that
13 conclusion is a very important one to our
14 investigation.

15 THE WITNESS: We agree and we will take that
16 as an action item.

17 MR. SCHLEEDE: When you were talking about
18 the yaw damper incidents and I think the Captain from
19 ALPA brought up about the procedure for disconnecting
20 the yaw damper. Is that currently in airline manuals
21 to your knowledge?

22 THE WITNESS: Now it is. Yes. But let me

1 make it clear again. It has always been in the
2 approved flight manual but it is now also in the
3 operations manual.

4 And by the way, I believe the approved flight
5 manual is required to be on board or in the cockpit of
6 every airplane.

7 MR. SCHLEEDE: What is your relationship, if
8 any, with FAA folks in Seattle?

9 THE WITNESS: I have very little to do with
10 them other than through the airworthiness organization.
11 I generally speak to them when we arrive at decisions,
12 or engineering does, and they carry it to the FAA. If
13 you're talking about quality of it, I think our
14 relationship is good.

15 We have disagreements from time to time on
16 the level of importance of things, but no more than any
17 other I've seen in past years.

18 MR. SCHLEEDE: How many DER's do you have
19 under your direction?

20 THE WITNESS: You know, I frankly don't know
21 what the total number is. I will guess in Renton maybe
22 50 or 60, somewhere in that order. There are DER's for

1 each of the various disciplines.

2 MR. SCHLEEDE: Where does the Boeing Air
3 Safety Office fall? Does that fall under your --

4 THE WITNESS: No. It's part of the flight
5 test organization.

6 MR. SCHLEEDE: So what is your -- do you have
7 a direct relationship with them or how do you interface
8 with the Boeing Air Safety Group?

9 THE WITNESS: Normally we just -- when we're
10 not in times like this where we're dealing with an
11 accident. We just see the things that they send over
12 for our folks. There's not a great deal of
13 interaction. In times like this, for the last month at
14 least one or two of their people have lived in my
15 office.

16 MR. SCHLEEDE: And I know you touched on this
17 with Mr. Phillips but I wasn't clear. Who is
18 responsible within Boeing for compliance with the
19 provisions of 21.3, FAR 21.3?

20 THE WITNESS: It is the airworthiness people
21 that have the responsibility within Boeing to actually
22 submit it to the FAA.

1 MR. SCHLEEDE: Do you have a role in
2 generating those data?

3 THE WITNESS: Yes, yes. Not generating but I
4 have a role. I would call it a consulting role. The
5 obvious ones, so there's nothing to discuss. Sometimes
6 you get events where a multiple of things have occurred
7 and it's a little confusing whether you have a
8 reportable item or just an incident of some sort. And
9 those they generally will bring over and we'll look at.
10 It is not uncommon to have to go back to the airline
11 for more data.

12 MR. SCHLEEDE: I realize that those
13 provisions are pretty subjective. I'm curious about
14 that, though. If something is obvious, has to be
15 reported, it's reported, but I'm interested in the gray
16 areas. Is it reported anyhow and analyzed later or is
17 it analyzed within Boeing before it's reported to the
18 FAA?

19 THE WITNESS: It depends on the magnitude.
20 If it's one of the 13 items and it just stands out like
21 an engine issue or fire or structural failure, that
22 sort of thing, there's no discussion required.

1 MR. SCHLEEDE: Well, we've been talking about
2 quite a bit of hard rudder kick type of event.

3 THE WITNESS: No.

4 MR. SCHLEEDE: How is that --

5 THE WITNESS: No. But in general, a yaw
6 damper kick, a failure, would not be a reportable event
7 unless the airplane was distressed or the incident was
8 very significant.

9 MR. SCHLEEDE: And regarding -- the last
10 subject. Regarding, -- I think it is -- the difference
11 between a safety item and a reliability item, how is
12 that determined? If it's a yaw damper kick, where does
13 that fall?

14 THE WITNESS: A normal yaw damper kick would
15 not be considered a safety item. And do not construe
16 my remarks about working on the yaw damper system as a
17 consequence of the accident. It is only in my view the
18 fact that we are having enough of them, too many of
19 them. And frankly, failures of that sort, when they
20 become an issue and a concern to the pilots and the
21 operators, have to be fixed, whether it be a safety
22 item or not. So, it's --

1 MR. SCHLEEDE: I'm sorry. I did have a
2 couple of other areas. In the documentation that we've
3 reviewed, the failure analysis leading to the
4 certification of the 737, we noticed that the basis
5 included a procedure for turning off A and B in the
6 case of hardovers.

7 THE WITNESS: Yes.

8 MR. SCHLEEDE: Are you aware of that
9 provision?

10 THE WITNESS: Yes. I'm aware of that. That
11 is not a recommended procedure by Boeing.

12 MR. SCHLEEDE: Do you have any knowledge
13 about how that has been removed or was there to begin
14 with and has since been not applied since it was a
15 basis for the certification?

16 THE WITNESS: It's a tough question. The
17 reason that that is not recommended is that the sort of
18 events that we're talking about here are generally --
19 or are controllable by the basic systems themselves.
20 Turning off the yaw damper is one thing, or the
21 autopilot, in the event of a failure is one thing. But
22 turning off the basic flight controls, A and B

1 switches, lead you into manual reversion on the
2 aircraft, and frankly the aircraft is harder to fly
3 with manual reversion than it is with the control
4 systems naturally. That's why the power systems are
5 there.

6 So, it takes a pretty drastic event to drive
7 you to have to turn off those systems. And since in
8 the history of the -300, -400 and -500 fleet we have
9 never had a dual hydraulic failure and we've never in
10 flight other than on tests had those systems off, and
11 we've frankly never had an event that we know of where
12 you would be required to turn those off, we think that
13 it's just not justified.

14 MR. SCHLEEDE: I misunderstood. You say
15 you've not had any dual system failures?

16 THE WITNESS: No --

17 MR. SCHLEEDE: In a 737?

18 THE WITNESS: -- dual hydraulic system
19 failures. We've had -- I'll be wrong on the number but
20 it's 12 or 20 or something like that in the earlier
21 -100 and -200 models, though none for all.

22 MR. SCHLEEDE: Oh, okay. I was wondering.

1 THE WITNESS: There were some then. But
2 there've never been any in the current fleet or the
3 newer fleet.

4 MR. SCHLEEDE: No dual system failures in the
5 -300 and subsequent?

6 THE WITNESS: Right.

7 MR. SCHLEEDE: Well, I realize there's a
8 special certification review team looking at the entire
9 --

10 THE WITNESS: Yes. The CDR.

11 MR. SCHLEEDE: -- background of the aircraft,
12 but for our investigation, I know we would be
13 interested in the genesis of this particular failure
14 analysis provision. So if you can help us, I know
15 we've got more work to do, but I'd like to resolve that
16 as to why that was used as one of the criteria to
17 certify the airplane and it's not a procedure that's
18 recommended or in the manual.

19 Thank you.

20 Last area. Are you -- do you know whether
21 there's any -- in the new aircraft, does the next
22 generation 737, is the rudder package generally the

1 same or is it going to be different?

2 THE WITNESS: As I understand it, they say it
3 is generally the same but it has to be increased. I
4 think they're looking at some cross-coupling issues and
5 I don't know what the resolution is on that.

6 MR. SCHLEEDE: But the general design
7 philosophy is for the PCU standby and servo valve?

8 THE WITNESS: Right.

9 MR. SCHLEEDE: Thank you very much.

10 CHAIRMAN HALL: Mr. Laynor?

11 MR. LAYNOR: Very briefly.

12 Mr. McGrew, you mentioned in response to Mr.
13 Phillips, plans or potential plans to conduct a flight
14 test using the 727 and the 737 aircraft. Has any
15 activity been undertaken to get that underway and
16 coordinated with the other agencies involved?

17 THE WITNESS: No. Not that I know of. We
18 have talked about it and I believe that we've talked to
19 the NTSB about it, but I don't think any action has
20 taken place. We've looked at some instrumentation
21 requirements for the '37.

22 MR. LAYNOR: I think one of the things I'm

1 after is whether the ball is in our court or whether
2 Boeing.

3 THE WITNESS: We'd like to think the ball is
4 in your court since the U.S. government happens to have
5 two airplanes that we could use to do this very nicely.
6 You understand that Boeing owns no 737's of its own so
7 we effectively bail an airplane from a customer before
8 it's delivered and use it for these kinds of tests,
9 which we can do. We also have no '27 to lead the
10 airplane. So we would very much appreciate it if you
11 would help us. I assume that the Board is in agreement
12 with the plan.

13 MR. LAYNOR: Well, I think the Board's in
14 agreement that such a test could be beneficial, but
15 we'll follow up on that.

16 Along the same lines, in your earlier
17 testimony in the hearing we saw the video and we heard
18 testimony about simulator testing for the vortex
19 encounters and I think I mentioned to Mr. Kerrigan then
20 questions about whether we were going to use further
21 using body effects and getting any kind of report with
22 instrumentation that we could review in that kind of

1 simulator exercise. Is that planned?

2 THE WITNESS: Yes. Mr. Kerrigan and I will
3 have some discussions about that and we will begin that
4 effort.

5 MR. LAYNOR: Do you know what kind of time
6 frame we're talking about?

7 THE WITNESS: I'll have to get with the
8 Stability and Control people and tell you what that is.
9 I can assure you that it is -- well, let's see. If I
10 remember correctly, the wing effort and the horizontal
11 effort took probably a couple of months to do, so I
12 would presume the body effort is going to take
13 something similar.

14 MR. LAYNOR: All right. I don't want to
15 preempt the Chairman's questions I know he's preparing
16 for, but I did want to ask one or two about flight
17 recorders.

18 The airplanes that are produced today, as you
19 mentioned, go out with 31 parameters. The ones
20 produced before some date in 1991 had 17 and the ones
21 in '89 or before '89 had 11.

22 Can you comment on whether the sensors and

1 the wiring harnesses and such were available on those
2 airplanes to upgrade them significantly?

3 THE WITNESS: No. They are not presently
4 available on those earlier aircraft. They'll have to
5 be additions to the basic aircraft.

6 MR. LAYNOR: However, I know a number of
7 those airplanes were probably delivered to European
8 customers that had far more parameters. Was that --
9 were the wiring harnesses installed as an option on
10 special aircraft?

11 THE WITNESS: I believe so. Frankly I'm not
12 certain of that. I hadn't been tracking that, so I
13 don't know. But I believe -- we have what's called an
14 MC or master change process by which a customer can add
15 to the basic order for his airplane and it would be
16 included in that. So it's simple thing to find out and
17 we can do so and let you know.

18 MR. LAYNOR: All right. Thank you, Mr.
19 McGrew.

20 CHAIRMAN HALL: Well, Mr. McGrew, there are a
21 number of items I'd like to cover with you and let me
22 just say on the subject of flight data recorders, I'll

1 start with that, and then I'll get back to that. But I
2 think it's very unsettling to the Chairman and it's
3 very unsettling I think to the flying public in the
4 United States to know that there are planes, airplanes
5 going out of the factory in Boeing overseas to Europe
6 that have more sophisticated information and flight
7 data recorders that would have provided possibly the
8 information that would have solved not only this
9 accident but possibly the one in Colorado Springs.

10 I'm going to ask you specifically at the end
11 of this for some comments and input on it, but it's
12 certainly an area that needs to be addressed. And I
13 guess nothing can highlight it any more than the two
14 accidents that we had at the end of this year, this
15 particular accident and the accident involving the ATR-
16 72.

17 And I don't know how many millions of dollars
18 this whole process is going to cost all the parties
19 here including a portion of it going to the flying --
20 the customers that are buying tickets and the American
21 taxpayers, but we just need to be sure that the
22 technology that's available today in this area is in

1 place on these aircraft.

2 Let me ask how many, roughly, and I'm not
3 asking specific number, but roughly how many employees
4 does Boeing have?

5 THE WITNESS: The Commercial Aircraft Company
6 has -- I think it's down to around 80,000-85,000 right
7 now. It was over 100,000 two years ago.

8 CHAIRMAN HALL: And how many engineers do you
9 have?

10 THE WITNESS: About 10,000. No. It's more
11 than that now. It's probably about 12,500 roughly.

12 CHAIRMAN HALL: The Transportation Safety
13 Board serves an important function in Congress in
14 ensuring that when unfortunately an accident like this
15 takes place, as I'm sure you're aware, and Congress
16 reminds me every time we go up, that we're to be an
17 independent agency. And when there is an accident we
18 need to be sure, independently, that we have all the
19 facts.

20 And I'm not going to belabor the points that
21 have already been made, except I would like to be sure
22 that this investigation, that all of the facts of

1 incidents and information in the computers and database
2 of the Boeing Corporation are looked at and part of
3 this investigation so that the American people have
4 comfort that we have done everything we can to ensure
5 that to either rule in or rule out the role of the
6 rudder. And I ask you for that. I'm sure I will get
7 that cooperation.

8 I understand that the way your structure is
9 that there's several different places that that
10 information may be obtained, but if you would, please,
11 sir, I would appreciate your assurance that you're
12 going to go back and be sure that whatever information
13 is available, if it's not been provided, will be
14 provided.

15 THE WITNESS: Mr. Chairman, you have my
16 assurance and I will do that. If I may comment, we
17 have been involved with the CDR that the FAA decided
18 should be put in place. We have opened all of our data
19 and all of our people's minds to them. They are
20 looking very deeply at the flight control systems.
21 They are going to come up with some conclusions here in
22 the fairly near future and we are holding back nothing

1 from them and we are holding back nothing from you.

2 If there are any items that you have not
3 received that you have asked for, they are things, as
4 I've said, who have fallen through the crack and we
5 shall go search those cracks.

6 CHAIRMAN HALL: I understand that. And the
7 situation as we know, Mr. McGrew, this accident has got
8 a lot of high visibility to it, as it should, with the
9 unfortunate loss of life that has taken place. And the
10 credibility of everybody here in terms of this
11 investigation and being sure that we have looked at
12 everything, is on the line.

13 And I want to be sure that until this Board
14 issues its report, if we have to go back to Washington
15 and conduct another hearing or come back to Pittsburgh,
16 that we've done everything we can to ensure everyone
17 that everything has been looked at and we've done our
18 job.

19 So with that, let me ask you just a little
20 bit about your monthly safety review that you
21 mentioned. Who are the people that participate in
22 that? And I assume this is a monthly safety review for

1 the 737-300, or how is that structured?

2 Just so we can fold out for everybody to see
3 the process that you all have to be sure that as you
4 get reports on operations, wherever they come from,
5 that they're being considered and looked at.

6 THE WITNESS: Okay. First of all, you should
7 understand that Boeing has two major divisions in the
8 Seattle area. One is the Renton Division and the other
9 is the Everett Division.

10 In Renton, we build the 737's and the 757's
11 and in Everett we build the 767's, the 747's and the
12 777's. So up until just recently we have had two
13 safety review boards, a Renton Board and an Everett
14 Board. They work in a very similar fashion.

15 Their population is composed of the chief
16 project engineers, the chief design engineers of the
17 disciplines, the flight controls, structures,
18 aerodynamics and appropriate groups, pilots,
19 airworthiness people and whatever engineers are
20 necessary to deal with the items that are on the
21 agenda. Oh, and the safety organizations. We have
22 specific safety organizations in the Boeing Company who

1 do nothing but track the numbers come out of the R&M
2 group and working with the safety of the aircraft.

3 Each items comes before the Board and is
4 reviewed and not all of those folks but most of them
5 are voting members of it and the decision is made as to
6 whether it is a safety item or not. If it is a safety
7 item, it goes off for special handling and that's how
8 the basic process works.

9 Now, recently or now, right now, we are
10 making a change to try to put those two boards together
11 because we have found that when you have two separate
12 boards that the 767 may make a decision on an item and
13 call it a safety item or the 757 down in Renton, which
14 is a very similar airplane, thinks it's not a safety
15 item. And so we have a little dichotomy then that we
16 have to resolve. So we're going to try to put them
17 together so that we have one safety organization for
18 the entire Boeing Company. It is a good process.

19 CHAIRMAN HALL: Who puts items or how do
20 items get on the agenda for the meeting?

21 THE WITNESS: I heard two questions. First
22 was who. And the answer --

1 CHAIRMAN HALL: Yes. Who and what. I'm
2 sorry.

3 THE WITNESS: The answer to who is anybody
4 can. Throughout the company in the engineering areas
5 and maybe in the factory, too, there are little boards
6 put up with a slip and anybody who thinks he knows
7 about a safety item can pick one of those up and write
8 it down and tell us that he thinks the wing is going to
9 fall off because a fastener was faulty or whatever it
10 is. I exaggerate.

11 And it actually goes into the safety
12 organization, the safety people review it, and in
13 general all things then come to the Board. They may
14 come with a proposal that one rivet will not cause a
15 wing to fall off so we shouldn't consider that. But in
16 general, we do see them. That's the who. The who is
17 anybody. Well, practically speaking, it is the safety
18 group itself that comes up with most of them, and
19 service engineering. I forgot to mention that they're
20 in this, too.

21 The how it is done is I think I described to
22 you. It is an agreement by the group amongst the

1 voting folks that it is a safety item.

2 CHAIRMAN HALL: What about if the USAir rep
3 for Boeing that's there in Pittsburgh, if he has a
4 concern, can that make it to this meeting?

5 THE WITNESS: Yes, because he will send his
6 concern in to service engineering. Service engineering
7 then will take that and send it on to the appropriate
8 people.

9 I would say that every day I go in I get four
10 to five items from service engineering that they think
11 I should see. Now, if I can get four to five, that
12 means there's probably 30 or 40 that are going out to
13 the various functional groups and I'll just see the
14 ones that they consider the most significant.

15 Believe me, the data gets around.

16 CHAIRMAN HALL: I guess also in the area of
17 systems and specifically the rudder system -- and you
18 listed the items or components in that system. I just
19 -- I know that you're aware that -- well, first of all,
20 you have pointed out very well that -- and it's been
21 said that the 737 is the workhorse of the world
22 aviation fleet right now; more passengers, more miles,

1 more takeoffs, I guess more landings.

2 You pointed out the safety record which you
3 have every right to be proud of. But the accident I
4 know that there's a concern which is not really a
5 concern of this particular accident, but there were
6 some regulations concerning aging aircraft in the
7 structures area.

8 Are there any regulations in terms of the
9 systems area as these airlines get older or is there
10 any number of hours, regular service, on these
11 components such as the rudder PCU? Or again, is it
12 just whenever these systems fail then they're sent in,
13 repaired and put back?

14 THE WITNESS: By and large, most items are
15 handled on condition and there are items that have life
16 limits in various parts of the airplane, but I think
17 not very many.

18 CHAIRMAN HALL: So I guess on those you're
19 very concerned then about the quality control of that
20 item if it's taken off the airplane, repaired and put
21 back. So that leads me into what is the relationship
22 then that you get into with someone like a Parker

1 Hannifin in terms of their work and if you could just
2 give us an overview of that and what quality assurance
3 or controls you all perform.

4 THE WITNESS: Okay. Organizations like
5 Parker are approved suppliers within the Boeing
6 organization, so they are on our list of a company that
7 supplies a working product and satisfies some of the
8 specifications that Boeing supplies in terms of your
9 quality processes and procedures. So to that extent
10 they are an approved and recognized supplier.

11 Now, we have within the various organizations
12 -- and you met one yesterday, Mr. Cline -- engineers
13 who are assigned on specific areas who deal very
14 closely with those folks and they are on the telephone
15 or visiting or traveling regularly to cover whatever
16 difficulties come up and meet whenever they need to do
17 it. So it's a quite closely tied operation.

18 There are some parts of the airplane, what we
19 call BFE items, where that is not quite so closely
20 controlled or understood, but in general things like
21 systems on the airplane are very tightly knit between
22 the two companies.

1 CHAIRMAN HALL: Just to follow up I guess, in
2 your monthly safety review operation are there pilots
3 as well as engineers that participate in that process?

4 THE WITNESS: Yes, yes. As well as operations
5 people who are sometimes pilots but deal with the
6 operational aspects of the airplane themselves.

7 CHAIRMAN HALL: Well, I have the good
8 pleasure of overseeing an operation that involves both
9 pilots and engineers and I may have to come to you for
10 some guidance on how you keep them in agreement at
11 times.

12 Let's see. I guess we have talked to you
13 today about some information. I've asked Mr. Haueter
14 and we can do this at the end, but I'd sure like to try
15 before we close this hearing to identify those things
16 that we still need to do. Be sure that if it's
17 something like Mr. Donner and the FAA and the NTSB
18 initiating some additional wake vortex tests, that when
19 we leave Pittsburgh we know what we're going to do and
20 we can put a time frame on it so that the flying public
21 and the American people know exactly what we're
22 continuing to do as part of this investigation.

1 Finally, I would like to -- I don't have it
2 in final form yet, but I'm going to give a letter to
3 you, sir, I hope before we leave here, basically asking
4 from you a suggested list of parameters for the FDR and
5 for you to also look at what we can do in terms of
6 specifically retrofitting or what could be done and
7 would be the most practical thing to do to provide the
8 most essential information you need to have for the
9 existing fleet that has the older aircraft.

10 Now there's another issue of whether if you
11 can have 90 or 100 or 200 parameters whether we should
12 be just putting them out with 31 out the door today,
13 but we'd like to look specifically at this type
14 aircraft because obviously I have at least read in such
15 publications as the Wall Street Journal that they're
16 going to be operating for a while and that we ought to
17 see what we can do.

18 Are there other questions parties?

19 Mr. McGrew, Mr. Schleede has one additional
20 question because at this point we do not have any plans
21 to recall you as a witness and there was an item that
22 he wanted to cover and this is the shot we hope to

1 have.

2 MR. SCHLEEDE: Yes. Originally we thought
3 we'd have the CDR completed report and we were going to
4 ask you questions. And since we don't have it, we will
5 have testimony this afternoon. I just wanted to for
6 the record ask. Are you aware of the status of the
7 special certification review team?

8 THE WITNESS: Yes, I am.

9 MR. SCHLEEDE: Have you been apprised of any
10 of the findings?

11 THE WITNESS: Yes, I have. I must say that
12 the findings are not in the complete status. There's
13 things yet -- yesterday, in the interview of Mr. Cline,
14 he described the requirements for a test and the fact
15 that one must have specific requirements for pass/fail
16 in general for a test. The same is true for something
17 like a CDR or the design of an airplane. We need to
18 have a criteria that tell us when we are over the fence
19 and safe versus yet there. And I think that part has
20 yet to be accomplished with respect to the CDR.

21 MR. SCHLEEDE: Are you aware -- I know we're
22 going to have testimony what the status and when we

1 think it's going to be complete?

2 THE WITNESS: I believe that they intend to
3 have a meeting with Boeing on the 7th of March. I
4 believe that's right. And I think they're planning on
5 having it complete within the next month or so, but Mr.
6 Zielinski I'm sure will give you that date.

7 MR. SCHLEEDE: Okay. One last. As a result
8 of what you've been apprised of so far, has there been
9 anything that has generated within Boeing the need for
10 change? Any urgent actions or changes?

11 THE WITNESS: I've seen a preliminary -- some
12 of their preliminary recommendations and I think I
13 can't answer this question at that time. I am very
14 concerned that, as in the design of an aircraft, that
15 when we set up a program that it have some definite
16 criteria and I think that's not been accomplished yet.

17 MR. SCHLEEDE: Thank you very much.

18 THE WITNESS: Mr. Chairman, could I make one
19 statement?

20 CHAIRMAN HALL: Please, feel free.

21 THE WITNESS: I hope it is very clear to you
22 -- I'm sure that it is -- that it is in Boeing's best

1 interest to find any faults that are in the aircraft if
2 there are any and find if there are not because without
3 the confidence of the customer and the traveling
4 public, we have no viable product and Boeing is here to
5 stay.

6 CHAIRMAN HALL: I certainly understand that.
7 As you know and I stated earlier, I went and spent an
8 entire day at your headquarters and came away very
9 impressed with what you're doing as part of this
10 investigation. The fact of the matter is that in the
11 real world we live in there are going to be people that
12 question any investigation and the independence that we
13 -- the trust for an independent investigation that was
14 asked of this Board, we intend to serve to the American
15 people. And that's why since we have an accident here
16 where there's no clear indication at this point exactly
17 what caused it that we are sure that the factual record
18 is as complete as possible.

19 And when we end up in a situation, Mr.
20 McGrew, just to be straight with you, that we request
21 information and then another party sends us information
22 that is pertinent that we didn't get from you, it

1 causes concern, not from the standpoint that things
2 don't happen and things do fall through the cracks.
3 But what the Chairman is asking is that you go back and
4 examine every crack so we don't have any question that
5 there's been any incident with this rudder or any of
6 these systems that might assist us and the experts in
7 trying to figure out what happened to Flight 427. And
8 that's the interest that I come -- that's where I'm
9 coming from.

10 I apologize to you. I'm from Tennessee and I
11 don't know how to express myself any more than just
12 that way. If there's a fact that's here that we need
13 to have, then we need to be sure that everything is
14 here and that we all work together. And whatever the
15 final report of this investigation is, everybody knows
16 that everything has been done.

17 But I really appreciate your presence and the
18 commitment of everybody.

19 John's got one more, too. I don't guess
20 we're going to let you get out of here.

21 MR. CLARK: It deals with the statement you
22 just made about requiring tests or test requirements.

1 And Mr. Cline made the same statement that you need a
2 pass/fail criteria for testing. And I think in that
3 may be true for certification but in the course of an
4 accident investigation, I think sometimes we're going
5 to be requesting tests just to see what happens to gain
6 more knowledge. And I don't know how to put a
7 pass/fail criteria, but I'm sure we'll have your
8 support on that.

9 THE WITNESS: I understand. Although I
10 submit there is a pass/fail definition there somewhere.
11 You just haven't found it yet. But I totally concur.
12 We will do tests to establish -- define trends and what
13 have you.

14 MR. CLARK: Thank you.

15 CHAIRMAN HALL: Machinists? Mr. Wurzel, you
16 had a comment? I'm sorry.

17 MR. WURZEL: We have one question.

18 Good afternoon, Mr. Purvis -- McGrew. I'm
19 sorry. Excuse me, John.

20 You mentioned several items that you think
21 did not go wrong in the rudder main power control unit
22 and standby power control area. In your opinion, what

1 control surface would cause the aircraft upset that was
2 not ruled out by the investigation?

3 THE WITNESS: I think that the rudder is the
4 logical candidate for the control surface. I happen to
5 believe that the slat has a possibility of being a
6 contributor to this and we will work or we are working
7 on establishing or ruling that in or out. Those are
8 the only two surfaces that we can see at this time that
9 could be involved.

10 MR. WURZEL: If it were the rudder, why
11 weren't the lateral control surfaces able to overcome
12 the effect?

13 THE WITNESS: The only thing I can presume is
14 that timely action was not taken, but that is purely
15 conjecture. We do not know.

16 I tell you, I would give my left arm for that
17 31 parameter machine.

18 MR. WURZEL: Thank you. So would we.

19 CHAIRMAN HALL: Well, thank you for your
20 patience, Mr. McGrew, and you may step down.

21 (Witness excused.)

22 CHAIRMAN HALL: Now, before we all run out,

1 I've got a couple of administrative announcements.

2 Number one is Mr. Haueter, how far do we need
3 to get today so we're not rushed tomorrow?

4 MR. HAUETER: I'd like to get through four
5 more witnesses.

6 CHAIRMAN HALL: Through four more witnesses.
7 So that's Mr. Purvis, Mr. Zielinski, Mr. Frey and Mr.
8 McSweeney.

9 MR. HAUETER: Mr. Riggin is replacing Mr.
10 McSweeney.

11 CHAIRMAN HALL: Yes. Mr. McSweeney has a
12 family situation and he cannot be here and he's being
13 replaced by who?

14 MR. HAUETER: Mr. Don Riggin. So I apologize
15 to -- I do not know how long to tell you that we will
16 be here today, except to tell you that we will complete
17 those four witnesses at least. If it moves faster,
18 then we'll pick someone else up.

19 Now, the members of the media need to be
20 aware that we are losing, as I understand it, half of
21 this ballroom tomorrow. We're flipping it tomorrow.
22 And so everything is unfortunately have to be picked up

1 and moved and I don't know what the configuration will
2 be but it will be different than it is today. So if you
3 plan on being here tomorrow to cover that, I wanted you
4 to have that information.

5 We've had a long morning. We will continue
6 back at 2:00 p.m.

7 (Whereupon, the luncheon recess was taken at
8 1:45 p.m.)

9

10

1 AFTERNOON SESSION

2 [Time noted: 2:05 p.m.]

3 CHAIRMAN HALL: We will reconvene the
4 hearing.

5 The next witness is Mr. John Purvis who
6 serves as the Director of Air Safety Investigation for
7 the Boeing Commercial Airplane Group out of Seattle,
8 Washington.

9 Welcome, Mr. Purvis. Mr. Schleede will begin
10 the questioning.

11 (Witness testimony continues on the next
12 page.)

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1 JOHN PURVIS, DIRECTOR, AIR SAFETY INVESTIGATION,
2 BOEING COMMERCIAL AIRPLANE GROUP, SEATTLE, WASHINGTON

3

4 (Whereupon,

5

JOHN PURVIS,

6 was call as a witness by and on behalf of NTSB, and,
7 after having been duly sworn, was examined and
8 testified on his oath as follows:)

9 MR. SCHLEEDE: Mr. Purvis, please state your
10 full name and business address for the record?

11 THE WITNESS: My name is John W. Purvis. I'm
12 with the Boeing Commercial Airplane Group. That's Post
13 Office Box 3707, Seattle, Washington 98124.

14 MR. SCHLEEDE: Could you give us a brief
15 background of -- description of your background and
16 education that brings you to your present position?

17 THE WITNESS: I have a degree in mechanical
18 engineering from the University of Washington and
19 another degree a year or so later in industrial
20 engineering, also a bachelor's.

21 I worked for the Boeing Company a lot during
22 school, part-time while I was going to school, and

1 hired on full-time after I graduated after the
2 mechanical engineering degree.

3 Initially came to the company doing customer
4 services work and did various areas of that for about
5 11 years, and then I went out as a field service
6 representative in the field overseas for about six
7 years. After that was over, I came back and did
8 various jobs.

9 And again, in 1982 I was given this job as
10 the head of the Air Safety Investigation Group and I've
11 been doing that for about 13 years. I have a total of
12 37 years with Boeing.

13 MR. SCHLEEDE: You said 37 years with Boeing?

14 THE WITNESS: 37. Yes.

15 MR. SCHLEEDE: Do you hold any FAA ratings or
16 certificates?

17 THE WITNESS: I have an FAA private pilot's
18 license, single engine land and I'm not current.

19 MR. SCHLEEDE: Would you give us a very brief
20 description of your responsibilities as director of the
21 Air Safety Group?

22 THE WITNESS: Yes. I have a group of myself

1 and six other investigators that are basically charged
2 with investigating any accidents or serious incidents
3 involving Boeing Commercial Airplane products and our
4 responsibility covers all products in the commercial
5 field, right from the 707 on up to the current
6 airplanes we building. Therefore, I work with both the
7 Everett and Renton Division.

8 I'm actually a part of the Engineering
9 Division, the same division as the data processors that
10 we'll be talking about later. That's where they're
11 housed.

12 I also do a lot of other safety work at
13 Boeing. I'm part of various committees and part of the
14 safety process that Mr. McGrew talked about.

15 MR. SCHLEEDE: And your responsibilities
16 include domestic and international accidents and
17 incidents?

18 THE WITNESS: Yes. We do both domestic and
19 international accidents and in fact, I think we do
20 probably many times more foreign accidents than we do
21 U.S.

22 MR. SCHLEEDE: Thank you very much.

1 Mr. Phillips, proceed.

2 MR. PHILLIPS: Thank you.

3 Good afternoon, Mr. Purvis.

4 THE WITNESS: Good afternoon.

5 MR. PHILLIPS: In your responsibilities with
6 Boeing as Director of Air Safety Investigation, could
7 you describe -- you mentioned in your introductory here
8 that you have I believe six investigators. Could you
9 describe what a normal daily duty would be for someone
10 on your staff?

11 THE WITNESS: Happily, major accidents such
12 as this one are few and far between. I think, of
13 course, this has been the biggest one in recent years,
14 but when we hear of an accident, we put together a team
15 that is launched usually along with NTSB. Our job
16 always is to support the USA investigator-in-charge who
17 would go in on an accident. If they don't go, they
18 usually give us the right to kind of act on their
19 behalf and we always feed back information to them.

20 But on a normal day, we're maybe hearing of
21 events, reading telexes that come addressed to us,
22 talking with the field reps and doing various safety

1 type jobs that might come our way.

2 MR. PHILLIPS: Do you routinely investigate
3 incidents? Do you send investigators to on-scene
4 location incidents?

5 THE WITNESS: The level that we break that at
6 is variable depending on what we think we're going to
7 learn from it. And again, we work very closely with
8 the customer services division. So if it's, say, a
9 Europe landing and a customer services person who is
10 very experienced in that area would go on his own
11 without my support, without any support from our group.
12 They would report back to us with what they learn and
13 copies of anything they picked up, taken photographs or
14 made reports, would end up in my file as well as their
15 own.

16 So it depends on the level of interest and
17 what we think we can learn from it. We're always
18 looking to learn of things that we can do to improve
19 the airplane.

20 MR. PHILLIPS: So the decision criteria is
21 based on the relative level of importance of being an
22 unknown event or safety related?

1 THE WITNESS: How much we can actually get
2 from the investigation.

3 MR. PHILLIPS: What kind of backgrounds do
4 your investigation staff have?

5 THE WITNESS: The investigators are engineers
6 and they've got an average of about 22 years or 23
7 years with Boeing. Some of them have other time in the
8 industry, so I think the industry average is around 25
9 years. Several of them have private pilot licenses and
10 I think one even has a commercial. Another one has an
11 A&P. But in general, they have a knowledge of the
12 company and its products and kind of our design
13 philosophies.

14 MR. PHILLIPS: Do they generally come from
15 within the company? Are they promoted to this position
16 or are they hired from other positions?

17 THE WITNESS: This is an interesting area. A
18 lot of people are interested in getting into it, so I
19 have no lack of interested candidates, and therefore, I
20 have kind of a wide pick of the people. I think
21 they're not promoted into it. They come into it
22 because they're interested.

1 MR. PHILLIPS: Could you describe how you
2 learn of accidents, incidents and other safety related
3 events in your office?

4 THE WITNESS: My office relies a lot on the
5 field service representatives, the kind of people that
6 Mr. Cohen talked about yesterday. We have about 200
7 field service reps all over the world. They're at some
8 120 different bases in about 58 different countries.
9 It's a very expensive network. And they are my eyes
10 and my ears.

11 They know that they can call us 24-hours a
12 day. One of the requirements to be an accident
13 investigator is they don't go back to sleep at night
14 after you've been awakened at 2:00 or 3:00 in the
15 morning and gotten a report. They can call in through
16 the Boeing switchboard and get ahold of us, and the
17 operators can run down a list and call us.

18 The other sources would be from the NTSB,
19 occasionally from the FAA, quite often from the media,
20 that we hear it -- hear or see it on television or read
21 it maybe in the press if it's a very remote accident.

22 MR. PHILLIPS: Let's talk about that just a

1 little bit. When the USAir Flight 427 accident
2 happened and you were initially notified of that, could
3 you tell us a little bit about the process that started
4 at Boeing that identified the people who would support
5 the investigation?

6 THE WITNESS: I think we heard probably from
7 many sources almost simultaneously. When this kind of
8 event occurs, the phone just really starts jumping off
9 the hook. And we begin the process of notification in
10 house. We make sure that we coordinate with you, the
11 NTSB, so that we know what kind of people we're
12 expected to bring and we tell you what we think we
13 should be bring. It's a lot of phone calls going back
14 between people like yourself and our people.

15 We learn who's going to be the NTSB
16 investigator-in-charge and who the other parties might
17 be that are coming. We also try and learn about the
18 circumstances surrounding the event so that we know
19 whether we need to send structures people or
20 aerodynamicists or pilot systems, whatever it might be.

21 We start the process going to choose team
22 members. We start travel arrangements. We start

1 gathering up data on whatever we might know about the
2 airplane, some of the basic things: when was it
3 delivered, how many hours did it have, and that sort of
4 thing.

5 In the meantime, other people are notifying
6 in house people. We have a call list of about 30 or 40
7 top people in the company that have a need to know, so
8 within an hour they're notified. We begin putting
9 together a message to our customers and our field
10 service reps telling them this has happened, a very
11 factual sort of thing. This airplane on this date had
12 this accident.

13 The team travels generally within 24 hours
14 and then gathers at the site to support you.

15 MR. PHILLIPS: As the investigation
16 progresses in its later stages and additional Boeing
17 personnel are needed to support the investigation, is
18 it your office that makes the decision of who's
19 involved at that point?

20 THE WITNESS: Yes. Once the team is on site,
21 of course, they go through their daily routines with
22 you in going out to the site and picking up wreckage

1 and whatever may be involved. Maybe helping read out
2 the flight data recorder and that kind of thing.

3 Generally we try to get everybody together
4 and have a call once a day so we know what's going on
5 at the site. And one of the important questions we ask
6 is are the right people there. And if a pilot's not
7 necessary, we might send him home and you may want
8 another structures person to help identify bits and
9 pieces of the airplane. So it's giving -- I think
10 maybe -- and I'm guessing now. Maybe 15 or more
11 different people travel -- probably more, traveled to
12 the USAir accident.

13 MR. PHILLIPS: When engineers are pulled out
14 of the engineering organizations to support the
15 organization, what priority are they given to work on
16 the investigation?

17 THE WITNESS: I guess I probably didn't make
18 the point that the person from my group that goes on
19 this investigation is the team leader from Boeing and
20 that person is one of my people. And he has pretty
21 much carte blanche for the company to go and get the
22 people he needs or I have that right. And I've never

1 heard of anybody saying no, they can't go. It becomes a
2 top priority.

3 And as you heard Mr. Kerrigan say, his group,
4 whatever it was, seven people or so, have basically
5 spent all their time since the accident, 120 percent of
6 their time, doing this kind of work. So it does take a
7 top priority.

8 MR. PHILLIPS: Other than an accident
9 investigation, in the case where an incident is
10 reported, what information comes to you and how does
11 that get used within the company?

12 THE WITNESS: Well, for this I'd go back to
13 the field service rep. You heard I think Mr. McGrew
14 speak, or maybe it was Brad Johnson, speak of a system
15 called BOECOM. I suppose that gets its name from
16 Boeing Communications or something like that, but it's
17 a network of computers that they can report in on or
18 they can report by phone or fax, too, but most of it
19 comes through BOECOM.

20 They have a criteria that if it meets an
21 accident or incident type of criteria, it's given an
22 ATA code that only my group can access off of BOECOM.

1 We pull that material off several times a day. Usually
2 it's preceded by a phone call telling us it's coming or
3 it may be confirming an earlier telephone call that
4 something happened.

5 That information is then distributed to
6 customer services, engineering, the area where Brad
7 worked, Brad Johnson. It goes to our reliability and
8 maintainability -- R&M they call it -- group. It goes
9 over to the airplane safety group who -- maybe we can
10 talk a little bit later about the relationship with
11 them. And it goes then to various people. And it's
12 our choice who might be interested.

13 In the case of things that might involve
14 rudders, it would probably go over to Mr. McGrew for
15 his review or some of his engineers. So, it gets a
16 fair distribution.

17 And I know from listening to the previous
18 witnesses it sounds cumbersome and its very, very
19 difficult to explain, but it works. It works really
20 slick. And the data gets around the company very
21 quickly. In the age of fax machines, I have some
22 things set up where I can just with the push of a

1 button go to eight or 10 different people with one
2 message. It works out very well.

3 MR. PHILLIPS: Is there a formalized system
4 that makes sure that all the proper parties are
5 connected within Boeing when an incident is reported?

6 THE WITNESS: Well, when it's an incident, a
7 serious incident or an accident where we actually have
8 to take action on that particular event to study it,
9 that's up to my people do to that. Or, if it comes in
10 say improperly or wrongly into the customer services,
11 engineering, they tie us into the loop right away.

12 Formal written down? Probably not. It just
13 works because people know what to do.

14 MR. PHILLIPS: Can you recall of hearing from
15 the NTSB that an accident or incident has occurred
16 before you have?

17 THE WITNESS: Oh, yes. Yes. And I think
18 maybe a case in point is this one that Mr. King talked
19 about earlier. I think that report in fact came from
20 him to you and you called us to see what we knew about
21 it and I think we were embarrassed to find out that we
22 didn't know about it. And then so we start the ball

1 rolling.

2 We call the rep over at British Airways --
3 and we've got several of them there -- and they find
4 out what they can and let us know.

5 MR. PHILLIPS: Where does the FAA fit in or
6 do they fit in within your system of reporting
7 incidents and being involved in the dispatch of your
8 people?

9 THE WITNESS: On accidents, of course, the
10 FAA is part of the team that's there. We talk with the
11 equivalent department of the NTSB at the FAA, the one
12 that Mr. Donner is head of quite a bit. But as far as
13 reporting events, the 21.3, the FAR 21.3 type events
14 are handled as you hear earlier through our airplane
15 certification office.

16 I meet with Mr. Riggin or one of my staff
17 does once a month at a meeting that's held at Boeing,
18 kind of a coordination, FAA coordination meeting, and
19 we report on recent events to him at that point.

20 MR. PHILLIPS: Mr. McGrew this morning
21 described a safety reporting system where employees
22 within the company can report things they think may

1 need further attention related to safety. Are you part
2 of that process and involved in it in any way?

3 THE WITNESS: Yes, we are. As a matter of
4 fact, it was invented by one of the people that works
5 for me and it became a pilot project. Then it grew as
6 kind of a second pilot into the Renton area and slight
7 different ground rules and things but the same idea.
8 In fact, they've improved on it.

9 Our system puts forms around -- I'm in the
10 flight test area, by the way. It's where we do the
11 flight testing of airplanes. Forms around in our area
12 for people to use but we don't have -- we fill the
13 boxes on the -- where these forms are available. But
14 it's called a safety concerns reporting system.

15 And as in the Renton system -- well, I guess
16 I'll say both systems, we get a variety of reports.
17 Some are reports of safety. You know, the carpet is
18 loose in the corner. And those we turn over to the
19 people that handle OSHA type things. But some of them
20 are airplane things and we work on those through a
21 formalized system.

22 And it can be anonymous. You don't have to

1 give your name. But if you want a response back, of
2 course, we've got to know where to send it so you have
3 to tell us that.

4 MR. PHILLIPS: I'm sure that in the course of
5 doing your job you're exposed to the safety officers
6 from other aircraft manufacturers, such as Douglas
7 Aircraft Company. Could you generally describe your
8 organization as different than the others or similar?

9 THE WITNESS: I think it's very similar. I
10 think all three organizations in the big jet
11 manufacturers our size, McDonnell-Douglas and Airbus,
12 we all report in through flight test at about the same
13 level and we all have accident investigators that are
14 similarly qualified.

15 I think the Airbus people are maybe more
16 flight oriented, but still engineering backgrounds.
17 And we do meet. Myself and McDonnell-Douglas people
18 meet more often because of the physical location and
19 the fact that -- can just pick up the phone and dial
20 Long Beach. But we exchange data. We tell each other
21 about events.

22 Because of our extensive system of field

1 service reps, there's often times where we hear about
2 an event before McDonnell-Douglas does, so it's always
3 with great joy that I'm able to wake up my equivalent
4 at 3:00 o'clock in the morning and tell him that it's
5 not mine.

6 MR. PHILLIPS: You guys keep count of who
7 calls who the most?

8 THE WITNESS: Yes.

9 MR. PHILLIPS: One final area. We've heard
10 testimony all through the week concerning FDR data and
11 the lack of, the appearance of some lack of data. Do
12 you have any opinions from the position that you're in
13 in accident investigation as to whether additional FDR
14 data parameters would be valid?

15 THE WITNESS: I think I'm right in step with
16 Mr. McGrew that I feel -- we feel -- that better data
17 is required. I think more parameters, higher sampling
18 rates both would be good. We've -- he and I have
19 started the ball rolling in the company with a
20 recommendation that this be accomplished. I think
21 we'll get some results.

22 I also recommended that we look at video, at

1 least assist in the development of video recording for
2 the cockpit. And also, look at how to handle the older
3 airplanes which is a big problem.

4 MR. PHILLIPS: I have no further questions
5 unless you have some comments or additions.

6 THE WITNESS: One thing I'd like to clarify.
7 I think we've talked about this, and since my name was
8 on the letter, I feel it's a job I need to clarify this
9 list of 187 events.

10 I think it's in Exhibit 9-AC and it's page 1.

11 MR. PHILLIPS: Page 1 of 9-AC?

12 THE WITNESS: Yes.

13 MR. PHILLIPS: Is that the letter to you?

14 THE WITNESS: Yes. That's the letter to me.

15 MR. PHILLIPS: Okay.

16 THE WITNESS: This was -- just wanted to
17 explain how the list came about and maybe a little bit
18 of why certain items weren't there.

19 The list resulted from Item 1 on page 1 and
20 it says, "Please provide a list of lateral and
21 directional control system upsets." And notice it says
22 lateral and directional, and it does say upsets. And

1 then it puts in parentheses "deviation from the
2 intended flight path involving the Boeing 737 series
3 airplanes that resulted in a precautionary landing or a
4 report by the flight crew," and then they give us some
5 dates or we agreed to some dates.

6 And this is a letter that I sent to Mr.
7 Phillips as a result of an earlier request. This was -
8 - we were on a short fuse to produce this data, so we
9 were trying to set up the rules that we could make we
10 gave you want you wanted.

11 And it said that Boeing may elect to use the
12 most complete source of data available. And then again
13 in parentheses it says, "BOECOM reports or reliability
14 and maintainability databases that can be searched by
15 automated means."

16 And so the reliability and maintainability
17 database is the most complete, so we chose that one and
18 went into it and gave you what came out of it. This
19 event was not there and frankly wouldn't be there
20 because the original report indicated that it was
21 almost a non-event. It says Air France Maintenance
22 Engineering reports that there were no known

1 maintenance actions due to the relatively small rudder
2 displacement.

3 So that's why that one didn't appear in the
4 database.

5 MR. PHILLIPS: Okay. So if that would have -
6 - and I appreciate your response. I realize it was a
7 fairly extensive request of data in a fairly short time
8 period for compliance, but I think I'm hearing you say
9 that had additional databases been searched and more
10 time been available, there may be additional items
11 added to the list or additional detail to the list we
12 have.

13 THE WITNESS: And I feel that will be
14 fulfilled by what we've committed to through myself and
15 Mr. McGrew to the Chairman.

16 MR. PHILLIPS: So that's something we can
17 look forward to in the future then?

18 THE WITNESS: Yes.

19 MR. PHILLIPS: I have no further questions.

20 CHAIRMAN HALL: Do any of the parties have
21 questions for this witness?

22 I see the hand of the Airline Pilots

1 Association.

2 Anyone else?

3 If not, Captain, would you please proceed.

4 CAPTAIN LeGROW: Thank you, Mr. Chairman.

5 Good afternoon, Mr. Purvis.

6 THE WITNESS: Good afternoon.

7 CAPTAIN LeGROW: I have just a couple of
8 questions.

9 First of all, we've heard a lot of discussion
10 on flight data recorders, the required parameters that
11 the FAA requires today. And I think we heard testimony
12 from Mr. McGrew that Boeing currently delivers the
13 airplanes with 18 parameters unless others are
14 requested by the customer. Is that correct?

15 THE WITNESS: I don't think that's correct.
16 I think he said 31.

17 CAPTAIN LeGROW: I'm sorry. What was that
18 again, please?

19 THE WITNESS: I think he said 31 parameters.

20 CAPTAIN LeGROW: Could you tell us how many
21 parameters the triple 7 will have when it's delivered
22 to customers?

1 THE WITNESS: I don't know. I think it's got
2 a 120 word frame recorder in it, but that's all I can
3 tell you. I don't know the number of parameters.

4 CAPTAIN LeGROW: Okay. Thank you.

5 We also heard some discussion on cockpit
6 video camera. And I think you said it's something that
7 you're looking into and your group is looking into.

8 Can you tell me if Boeing currently delivers
9 airplanes with cockpit video cameras to customers?

10 THE WITNESS: We don't currently deliver
11 airplanes that I know of with cockpit video cameras.

12 CAPTAIN LeGROW: So worldwide there's no
13 customers that you deliver airplanes to with cockpit
14 video cameras?

15 THE WITNESS: Well, I think -- I cannot say
16 that. Some customers for security reasons may have
17 that, but beyond that, I don't know. But we do use it
18 in flight test airplanes to record data that's on the
19 front panel.

20 This was a subject that we started off an
21 interest in -- well, actually before I joined the
22 group, so it would have been 14 years ago. One of my

1 fellows that later became one of my investigators made
2 a presentation at an ISASI meeting, International
3 Society of Air Safety Investigators, about cockpit
4 video recorders and I think we've been trying to
5 promote it ever since.

6 CAPTAIN LeGROW: Thank you. I'm still not
7 sure I understand the answer. Is the answer yes or is
8 the answer no.

9 THE WITNESS: The answer is -- your question
10 was do we deliver airplanes with recorders, video
11 recorders, and I think for use as an accident
12 investigation tool, not that I know of. But some
13 customers may have them for security purposes.

14 CAPTAIN LeGROW: Thank you. I have no
15 further questions.

16 CHAIRMAN HALL: Do any of the parties have
17 additional questions?

18 (No response.)

19 If not, Mr. Marx?

20 MR. MARX: No questions.

21 CHAIRMAN HALL: Mr. Clark?

22 MR. CLARK: I have no questions.

1 CHAIRMAN HALL: Mr. Schleede?

2 MR. SCHLEEDE: Just a couple of areas.

3 Regarding your discussion of these various
4 programs for evaluating data, incident data, I want to
5 put a time frame on your comments. Is this program you
6 just described to Mr. Phillips something that's been in
7 being for a considerable length of time or is it two
8 years ago or one year?

9 THE WITNESS: We've just in the last really
10 about one year had a new program going. It's called
11 Airplane Safety Awareness Progress, and it's a very
12 comprehensive system that I think Mr. McGrew was
13 describing where the data, it's basically done by the
14 reliability and maintainability organization -- sorry,
15 by the airplane safety organization. It has several
16 boards set up to review data, safety review boards.
17 Not to review data but to review the recommendations
18 that would come from people that are reviewing the data
19 on things that may be safety concerns.

20 As he indicated, an SIP system feeds into
21 that if it has a safety implication. I've done a
22 little thing called an AIR Board. The acronym AIR

1 stands for Accident Incident Review Board at Boeing in
2 the flight test area and my boss is the director of
3 flight tests, so anything he thinks is of interest gets
4 on that, and that can get fed into the ASAP system, A-
5 S-A-P.

6 We also have a group of people that have been
7 given an extra task -- I don't think it's a full-time
8 job with any of them -- called Safety Advocates and
9 these are people that are strategically placed
10 throughout the company, maybe 20 people, higher level
11 engineering people with a real knowledge of what the
12 systems should do and can do, and they're reviewing a
13 lot of the data and they can input to the safety review
14 board, too.

15 MR. SCHLEEDE: I know that you and I had a
16 personal conversation about this and I'd like to make
17 an official request for at a later time as one of our
18 to-do's here to get a diagram and full description of
19 the ASAP and AIR program for our record.

20 THE WITNESS: I think if we could do that in
21 conjunction with the promise of how data flows through
22 the company that we promised the Chairman, we'll do

1 that.

2 MR. SCHLEEDE: That's exactly what I'd like.

3 And along that line, I had a question here directly to
4 you in your position as Air Safety Director.

5 Do you feel comfortable that events that are
6 related to air safety in line operations are getting to
7 Boeing and are getting fairly analyzed?

8 THE WITNESS: Well, I think they are, yes.

9 As I've said, it sounds cumbersome and it sounds
10 complicated and with a company of the size of the
11 Commercial Airplane Group which is -- I think Jean
12 McGrew said 85,000, which is probably a good number.
13 It is a difficult process but it does work. It mainly
14 works because people know each other and know how to do
15 these things. But I'm comfortable that I'm hearing
16 about the events that I need to hear about and I'm
17 comfortable that the flow of data is working well.

18 MR. SCHLEEDE: Thank you. That's all I have.

19 THE WITNESS: Thanks.

20 CHAIRMAN HALL: Mr. Laynor, no questions?

21 MR. LAYNOR: No questions.

22 CHAIRMAN HALL: Mr. Purvis, who do you report

1 to?

2 THE WITNESS: I report to the Director of
3 Flight Test, Mr. Kenneth Higgins.

4 CHAIRMAN HALL: And how many steps between
5 you and the head of the Boeing Commercial Aviation
6 Group?

7 THE WITNESS: He reports to the Senior Vice
8 President of Engineering and that man works for the
9 President.

10 CHAIRMAN HALL: And do you feel in this
11 structure that you have the independence that any
12 safety concerns that come to your attention that aren't
13 properly being addressed that you can be sure they get
14 the proper attention from the men or women in charge?

15 THE WITNESS: Yes, I do. I think
16 organizationally, if I reported to the President, I'd
17 probably get no more or no better contacts. I can pick
18 up the phone and call the person any time I need to. I
19 generally don't go to the President but I have in many
20 cases gone to the Senior VP.

21 This man also operates in a new area that
22 they call the Office of the President, so he has, like

1 when the President isn't there, these people can act in
2 the President's behalf.

3 CHAIRMAN HALL: You have told us and I think
4 all of us are very aware of what happens after an
5 accident. Could you tell us what involvement you have
6 in terms of evaluating data and what data you look at
7 in making safety recommendations?

8 I assume your responsibility also includes
9 accident prevention, and how does that process work?

10 THE WITNESS: Accident prevent is an
11 important part of my job. The system that I was
12 describing in response to Mr. Schleede's question, the
13 ASAP program, that is 100 percent accident prevention
14 and that is new and it's still getting going but it is
15 in operation.

16 The AIR Board that I am in charge of running
17 is also accident prevention. The other areas that
18 we've more recently been involved is a major effort say
19 in China where we've had many, many Boeing people go to
20 China to train them in the safety areas because there
21 was concern about the operating environment in China.
22 And it isn't just safety or accident investigation. We

1 described the whole safety process to them.

2 And I think the NTSB through Mr. Feith, as I
3 recall, and Mr. Donner's office, had people over there
4 just recently. And now they're coming back -- the
5 Chinese people are coming back to the United States to
6 go to Oklahoma City for training and I think we're
7 going to end up in your laboratories to learn about
8 data.

9 So this is our prevention. We're looking at
10 doing the same sort of a thing in Russia. The scope is
11 yet undetermined but the plan is there.

12 CHAIRMAN HALL: And the organization is ASAP,
13 is that it?

14 THE WITNESS: The one I was describing to Mr.
15 Schleede is Airplane Safety Awareness Process, ASAP.

16 CHAIRMAN HALL: And how long has that been in
17 process and --

18 THE WITNESS: About one year.

19 CHAIRMAN HALL: -- what prompted the creation
20 of that?

21 THE WITNESS: I think the creation was
22 prompted by the fact that we knew we had these many,

1 many pieces of data coming into the company and it
2 probably wasn't getting as formal a look as was
3 necessary.

4 CHAIRMAN HALL: And where do you get data?
5 I'm still trying to ascertain all the little points of
6 data and how you all access all of them or if you do.
7 The ASRS system, for example, that NASA runs, do you
8 all routinely look at that or are you aware of those
9 reports? Do you have an 800 number? A pilot that had
10 a concern that he thought needed to be brought to your
11 attention immediately, who would he call?

12 THE WITNESS: I think if you had a question,
13 you could call me or Mr. Schleede or any of his
14 investigators could call and we would, in whatever time
15 frame that we needed, we could test the system and see
16 what it would give us like we did for these events.

17 You asked about the ASRS?

18 CHAIRMAN HALL: ASRA.

19 THE WITNESS: Right. We do use that as part
20 of our data system. We use the FDR's. We use all of
21 this information that I said comes in through BOECOM.
22 That's a number that we talked about. I think Mr.

1 McGrew said around 100,000 incoming reports a year, not
2 all of which of course go into these databases because
3 a lot of them are duplicates or follow-ons to previous
4 messages and that kind of thing. But thousands of them
5 literally go into the database every year.

6 There's one called Jet Transport Safety --
7 JTSE, and I can't tell you right now what it stands for
8 but it is one that we use quite a bit and it logs in
9 all accidents, incidents and then things that are
10 called events. It is a good system. It gets about --
11 it's got about 47,000-48,000 events in it now and it is
12 computer accessible. Of course, it's all computerized.
13 It's got about 500 scan fields that you can look at,
14 depending on what it is you're looking for.

15 CHAIRMAN HALL: The Colorado Springs
16 accident, could you tell me essentially, if you would,
17 just basically what if any changes were made in terms
18 of continuing to follow that accident? In other words,
19 what was done -- and there was a specific
20 recommendation of the NTSB I guess in regard to galling
21 and then the FAA came back and basically in a letter
22 indicated that the galling was detectable by the pilot

1 and was not an unsafe condition.

2 Were you consulted on that? Were you part of
3 any meetings between the FAA and the company when that
4 subject was discussed?

5 THE WITNESS: No, I was not.

6 CHAIRMAN HALL: All right. Well, Mr. Purvis,
7 is it fair for me to characterize that Boeing
8 Corporation is a worldwide leader in aviation safety?

9 THE WITNESS: That's very nice. I'll take
10 it.

11 CHAIRMAN HALL: Well, I would like you all to
12 help us in the area of flight data recorders and be
13 sure that no one else is put in planes -- I understand
14 McDonnell-Douglas, Mr. Clark tells me, provides more
15 parameters, right, and off the line, than Boeing. I am
16 going to send a letter which is being prepared and I
17 will address to each one of the parties because of this
18 investigation that reads as follows. And this will go
19 to each one of the party representatives.

20 "The National Transportation Safety Board
21 will be evaluating the need for urging improved
22 standards for flight data recorder parameters. I would

1 like to have the collective wisdom of the parties to
2 this investigation to assist us in this evaluation.
3 Hearing Exhibit 10-D which I believe has been furnished
4 to obviously all the parties, titled FDR or Flight Data
5 Recorder Parameter List, contains a description of the
6 current requirements for Boeing's aircraft, depending
7 on the date of certification and/or manufacture of the
8 aircraft, plus additional parameters that we believe
9 would be appropriate and feasible.

10 "I would like the parties to provide to the
11 National Transportation Safety Board, Mr. John Clark,
12 who is going to be the individual designated by me to
13 get this information or to me, their views on the need
14 for specific parameters cited in 10-D and any
15 additional parameters deemed appropriate.

16 "Please consider all parameters that could
17 reasonably assist in future investigations so we can
18 more expeditiously and thoroughly determine the facts,
19 conditions and circumstances of accidents and incidents
20 in order to prevent future accidents.

21 "There are many parameters that could be
22 recorded. There are many that are recorded on quick

1 access recorders which are not crash proof. Some
2 manufacturers deliver airplanes equipped with flight
3 data recorders that record many data parameters well
4 above the minimum requirements. It seems that
5 monitoring programs, such as flight, operation and
6 quality assurance programs and incident investigations
7 could make effective use of additional parameters in
8 the prevention of accidents.

9 "We would like comments regarding the
10 practical implementation of a requirement to upgrade
11 recorder standards giving consideration to the
12 availability of digital data sensors and recorder
13 capacity and the extent of modification required. We
14 would also like views about the value of videotape
15 recorders, particularly on those older airplanes where
16 the addition of sensors and line passages may be deemed
17 impractical.

18 "I would appreciate receiving your input by
19 the close of business on February 3rd, 1995."

20 Since it does not appear that we are coming
21 to any conclusion, although this hearing is not over,
22 it is leading us into a probable cause at this time, I

1 want to not only encourage, as I have mentioned, to
2 continue this investigation with all the resources that
3 are available to us. But at the same time urge that we
4 take practical steps necessary to be sure that in any
5 very, very unfortunate event in the future that might
6 occur, that we have the information available that
7 current technology can provide.

8 So I would provide each one of you gentlemen
9 and representatives with one of these letters and
10 appreciate your cooperation in getting the response
11 back to the Board as soon as possible.

12 Mr. Purvis, you have been a very helpful
13 witness. I do not know -- do we have any other
14 representatives from Boeing that are going to appear
15 later?

16 THE WITNESS: Yes. One more.

17 CHAIRMAN HALL: We do? Okay. Well, I was
18 going to thank you for the many witnesses you have
19 provided, but if you'll got one more, I'll wait and do
20 that with that individual. But you are excused. Thank
21 you.

22 THE WITNESS: Thank you.

1 (Witness excused.)

2 CHAIRMAN HALL: The next witness is Mr.

3 Michael Zielinski, a Team Leader for the Federal

4 Aviation Administration in Seattle, Washington.

5 (Witness testimony continues on the next page.)

1 MICHAEL ZIELINSKI, TEAM LEADER, FEDERAL AVIATION
2 ADMINISTRATION, SEATTLE, WASHINGTON

3 (Whereupon,
4 MICHAEL ZIELINSKI,
5 was call as a witness by and on behalf of NTSB, and,
6 after having been duly sworn, was examined and
7 testified on his oath as follows:)

8 CHAIRMAN HALL: Mr. Zielinski, welcome. Mr.
9 Schleede will begin the questioning.

10 MR. SCHLEEDE: Please give us your full name
11 and business address for the record?

12 THE WITNESS: My name is Mike Zielinski and I
13 work for the Federal Aviation Administration at the
14 Regional Office located at 1601 Lynd Avenue Southwest,
15 City of Renton, State of Washington.

16 MR. SCHLEEDE: And what is your position with
17 the FAA?

18 THE WITNESS: My current position is Project
19 Officer within the Standards Staff, Transport
20 Directorate.

21 MR. SCHLEEDE: And that's in Seattle?

1 THE WITNESS: Renton, Washington.

2 MR. SCHLEEDE: Renton. I'm sorry.

3 Would you give us a brief description of your
4 education and background that qualifies you for your
5 current position?

6 THE WITNESS: I have a degree in aeronautical
7 engineering that I obtained in 1965. I've worked at
8 the Boeing Company for 18 years in various capacities;
9 flight test, avionics staff, operations and
10 engineering.

11 During that time period I was a DER flight
12 test analyst for 10 years. Joined the FAA in 1983.
13 There again, worked various capacities within the
14 Transport Directorate as well as Flight Standards.

15 I was Project Manager of a number of advisory
16 circular programs and a training program. I was also
17 manager of the aircraft evaluation group for about six
18 years. That group was responsible for master equipment
19 lists, maintenance reports, flight standards board
20 reports as it applies to flight crew type ratings.

21 I've been assigned this responsibility as a
22 Team Leader for the critical design review of the

1 Boeing 737 flight control system.

2 MR. SCHLEEDE: Do you hold any FAA ratings or
3 certificates?

4 THE WITNESS: No, I do not.

5 MR. SCHLEEDE: Thank you. Mr. Phillips will
6 proceed.

7 MR. PHILLIPS: Good afternoon, Mr. Zielinski.

8 THE WITNESS: Good afternoon, Mr. Phillips.

9 MR. PHILLIPS: We've called you to the
10 hearing to discuss the CDR which we use in brief for
11 critical design review team. I understand that you
12 were designated as the leader to that team?

13 THE WITNESS: Yes.

14 MR. PHILLIPS: And I'd like to ask you what -
15 - exactly what is a CDR?

16 THE WITNESS: Each CDR team is a little
17 different depending upon the circumstances, but simply
18 put, though, they all have generally the same concept.
19 That is, for the given issue that needs to be
20 addressed, a special group of specialists, I should
21 say, is a form to review, be it a component system or
22 an airplane level issue with respect to identifying

1 deficiencies, establish criticality and then make
2 recommendations for action.

3 MR. PHILLIPS: So there've been CDR's before
4 within the FAA?

5 THE WITNESS: Yes.

6 MR. PHILLIPS: Can you recall any recent
7 ones?

8 THE WITNESS: The Sioux City accident there
9 was a CDR. I believe on a Hartzell Prop there was a
10 CDR. I'm not aware of any others. It's a tool the FAA
11 uses to help it identify, clarify, hopefully solve some
12 issues.

13 MR. PHILLIPS: To define a CDR in the
14 original forming of the group, who requests the CDR and
15 how would you start a CDR if you wanted one performed?

16 THE WITNESS: Generally speaking it's a
17 management initiative, having identified a concern. In
18 this particular case, the formation of a Boeing 737
19 flight control CDR was a concern relative to there had
20 been a number of accidents and possibly there is
21 something overlooked. And the approach taken in this
22 particular case was the formation of a team independent

1 from the accident investigation that would take a fresh
2 look at the control system on the 737.

3 The team in this particular case was formed
4 the end of October of '94 and there are eight people
5 involved in the process; a flight test pilot and three
6 engineers, a representative from the National
7 Transportation Safety Board. We have a representative
8 from the Ministry of Transportation, Transport Canada,
9 and the United States Air Force.

10 And the function of the team in this
11 particular case is to review the entire flight control
12 system of the 737, all models. Our current status at
13 this time is we're roughly halfway through that task.
14 We are in the process of deliberating with regard to
15 any significant issues, their level of criticality, and
16 subsequently any recommendations.

17 It is our goal to complete the process,
18 including any action plan associated with that review
19 by the end of March of this year.

20 MR. PHILLIPS: When you selected your team
21 members for the CDR, who made the selection and how did
22 you go about picking the people?

1 THE WITNESS: I was not involved in that
2 process, but management solicited recommendations
3 throughout the FAA and I believe it was Mr. McSweeney's
4 recommendation to include the NTSB and representatives
5 from the Ministry of Transportation and DOD.

6 MR. PHILLIPS: Did you seek out any special
7 talents or qualifications in the team members?

8 THE WITNESS: Yes. We wanted to assure
9 ourselves that we had followed the -- had sufficient
10 skills to identify issues relevant to flight controls,
11 flight test pilot, hydraulics expert, a mechanical
12 systems individual. Besides the design of the flight
13 control system, our concern was also with continued
14 operational safety. And so as per the team, some
15 members were airworthiness people from the standpoint
16 of being very familiar with maintenance programs. They
17 are our resource for obtaining a fair amount of service
18 history information.

19 MR. PHILLIPS: I realize that your team is
20 still together and working but could you say whether
21 you're satisfied with the makeup of your team? Do you
22 have or had you had the team members participating that

1 you needed to do the job?

2 THE WITNESS: It would have been nice to have
3 more people. The task is quite --

4 CHAIRMAN HALL: How many people, could I ask,
5 are on the team?

6 THE WITNESS: Eight.

7 CHAIRMAN HALL: Eight?

8 THE WITNESS: Eight.

9 MR. PHILLIPS: And these eight people, have
10 they been performing other tasks?

11 CHAIRMAN HALL: It's not a football team, is
12 it.

13 MR. PHILLIPS: It's one short of a baseball
14 team, I think.

15 THE WITNESS: But it's not our only resource,
16 that is, the team members. We have access, of course,
17 to any consultants that we feel are necessary and
18 without a doubt, certainly the Boeing Company and all
19 their resources. They were a principal participant in
20 the exercise as far as providing data necessary to do
21 the evaluation.

22 CHAIRMAN HALL: Okay.

1 MR. PHILLIPS: So generally you've been
2 satisfied that you've had the people to do the job and
3 would have liked a few more.

4 THE WITNESS: I must say this is my first --
5 well, my second experience really with the
6 participation of a member from the National
7 Transportation Safety Board. Just as an aside, I was
8 involved in another program, blood borne pathogens as
9 it relates to accident investigation where I was very
10 much involved with the NTSB there. We developed a
11 program that both the FAA and the NTSB shares as far as
12 training accident investigators.

13 In this case, the NTSB representative has
14 been very helpful to the process and through that
15 representative, I'm sure that as we progress through
16 our exercise, the Board will be made aware of where we
17 are at.

18 MR. PHILLIPS: During the course of your CDR
19 team work, were you provided data from the accident
20 investigation through the NTSB contact? Was there a
21 coordination effort made?

22 THE WITNESS: Our task wasn't to investigate

1 the accident. It was independent from that effort. We
2 had access to it as we desired it, but our focus was
3 more on the design, design concepts, failure modes and
4 effects, what was the service history of the flight
5 control system, and trying to establish are there any
6 significant deficiencies that ought to be corrected.

7 CHAIRMAN HALL: I may be jumping in, Greg,
8 but I apologize. I just wanted to understand -- and
9 you may be going down this road -- how this study is
10 organized and what it's going to be looking at, and
11 particular where they're getting their data from.

12 MR. PHILLIPS: Yes. That's on the
13 agenda.

14 CHAIRMAN HALL: Okay.

15 MR. PHILLIPS: Pull me back if I slip past
16 it.

17 CHAIRMAN HALL: No, no.

18 MR. PHILLIPS: I guess that a good place to
19 turn now that it's stuck in my mind.

20 We heard earlier some discussion from Mr.
21 Cline and Mr. McGrew, a discussion of requirements and
22 plan of attack and pass/fail criteria. Could you give

1 us a summary of the guidelines the CDR was chartered
2 under, what your objectives were, goals, timetable?

3 THE WITNESS: A limited charter was drafted
4 for principal guidance to the team. In effect, it was
5 identify the deficiencies, establish criticality, make
6 recommendations. It was left up to us as to how we
7 might go about that process. One of the important
8 things was the team members were chosen, and in
9 particular the engineers, from the standpoint that they
10 were not directly involved with the certification or
11 activity around the 737 but yet they were specialists
12 in their particular area.

13 And through the process of familiarization
14 and review of the failure analysis, through that
15 question and answer process, we had hoped that we could
16 uncover things that haven't been looked at in the past
17 or have been ignored.

18 The plan of attack then was to familiarize
19 the individuals with the design features of the 737, to
20 review the failure analysis available from the Boeing
21 Company, to -- in our particular case, we devised our
22 own simulator exercise to establish -- help us

1 establish criticality of certain failure conditions.
2 And then we made access or received all AD's on the
3 737, all service bulletins, all service letters, all
4 SDR's pertinent to flight controls, hydraulics and
5 accessed the Aviation Safety Reporting System through
6 the Office of Aviation Safety within the FAA.

7 And we've tried to digest all that
8 information from the standpoint of what is it telling
9 us with regard to frequency of failures, kinds of
10 failures, any particular model issues, et cetera. So
11 it's kind of database that we were exercising.

12 MR. PHILLIPS: Did all eight people work
13 together the whole time? I mean, was there a task
14 assigned and eight people went off to do the task or
15 were you broken down into smaller subgroups?

16 THE WITNESS: On occasion we did split
17 ourselves only to expedite the process, but we all
18 reviewed the data available. That is, we all
19 participated in a review of the analysis from the
20 Boeing Company and the service history information.

21 On occasion, some of the members did visit
22 other suppliers; that is, people like Parker,

1 Honeywell, Scurry. We visited Tramco; had discussions
2 with Fortner; and I talked to McDonnell-Douglas, all
3 with the intent of obtaining as much information as we
4 could with regard to service history.

5 Our exercise with Douglas was to give us a
6 counterpoint, so to speak, from the standpoint of
7 design philosophy.

8 MR. PHILLIPS: Has the team's time been
9 devoted entire to the CDR from its inception? Has it
10 been a full-time for each one of the members?

11 THE WITNESS: It's certainly been a full-time
12 job for myself. No, it hasn't unfortunately. I
13 believe since the end of October, roughly speaking, the
14 members of the team have spent about 50 percent of
15 their time and that is directly in support of the
16 activity. We do have other commitments.

17 MR. PHILLIPS: Have you been subject to any
18 FAA management or oversight of the project?

19 THE WITNESS: No. This has been a very
20 refreshing project for me from the standpoint of the
21 lack of specific direction. We were very free to
22 choose a course of action and all our steps were taken

1 from a team approach, so it's been very much a
2 consensus. I do appreciate the freedom that we've had
3 in this particular exercise. The freedom goes beyond
4 just look at the design, but even to challenge our own
5 regulations and policy.

6 MR. PHILLIPS: You described earlier meetings
7 and examinations at various manufacturers, including
8 Boeing. Could you characterize Boeing's participation
9 in supporting the CDR efforts?

10 THE WITNESS: Boeing has done everything that
11 we asked.

12 MR. PHILLIPS: Has there been any flight
13 testing done as a part of the CDR evaluation?

14 THE WITNESS: No. We have conducted a
15 simulator exercise in a multipurpose cab. We had a --
16 we put together a test program that included a little
17 over 50 some conditions that we looked at, various
18 failures and consequent effects.

19 We had two FAA pilots that participated in
20 that exercise. All that data will be part of our final
21 documentation.

22 MR. PHILLIPS: I realize that your work's not

1 complete at this time. Could you give us an idea of
2 within the scope of your knowledge today, what any
3 significant findings may be and what your knowledge
4 today what any significant findings may be and what's
5 your plan for finishing the program?

6 THE WITNESS: We have identified a number of
7 concerns and you might say that's basically what Mr.
8 McGrew had made reference to. These concerns are still
9 in deliberation. Like I've said, there's a lot of data
10 that we're reviewing. Having identified a failure is
11 not enough. It needs to be established as to its level
12 of criticality and so that's where we're at. We're
13 still sorting the information, as appropriate, to the
14 concerns that we've identified.

15 I fully anticipate that, again, by the end of
16 March, that information will be -- that process will be
17 completed.

18 MR. PHILLIPS: Have any of your concerns or
19 the failures that you've identified, were they affect
20 the immediate safety of flight of the fleet?

21 THE WITNESS: No.

22 MR. PHILLIPS: Have you seen any indication

1 in your work today that would affect the progress or be
2 beneficial to the investigation of this accident?

3 THE WITNESS: This is my first time seeing a
4 lot of the information that's been gather with regard
5 to the accident. I would hope that through our
6 representative, the information, the things that we're
7 thinking about, could be passed through the NTSB
8 representative to the appropriate panels.

9 MR. PHILLIPS: And when the report is
10 completed sometime in March, what will be the process
11 for publishing the report? Will it be a public
12 document? And exactly what's the end result of the
13 CDR?

14 THE WITNESS: It is the FAA's intent that the
15 final report be a public document. Of course, through
16 this whole process we'll be discussing the issues
17 identified with the Boeing Company and in that
18 publication of the document will be an action plan as
19 to the execution of the recommendations.

20 MR. PHILLIPS: At this time, I -- oh, I'm
21 just -- one more question.

22 Based on your experiences with the CDR team,

1 would you have any recommendations for this
2 investigation? Additional avenues to pursue, any areas
3 of consideration that you haven't heard in discussion
4 today or this week?

5 THE WITNESS: Not with regard to this
6 accident investigation. There's more we want to do
7 within our own exercise. There is a consideration
8 within our exercise from the standpoint that we limited
9 ourselves to the lateral directional. We, early in the
10 program, decided to eliminate the pitch axis. It
11 didn't seem to be an issue, at least not as strong an
12 issue as the lateral directional.

13 If I were to do it all over again I would
14 probably include the pitch axis and make it a complete
15 -- do a complete job.

16 MR. PHILLIPS: Would it be safe to say that
17 in the CDR's review of the directional control system
18 you have reviewed the rudder actuation system?

19 THE WITNESS: We have reviewed every element
20 within the directional and lateral control system.

21 MR. PHILLIPS: And those areas will be
22 covered in your final report?

1 THE WITNESS: Yes. Brackets, cables,
2 pulleys, control units, transfer mechanisms,
3 alternative means of flying the airplane. It's one of
4 the neat things for me about this particular report or
5 activity is that we have the opportunity to be as
6 comprehensive, and the degree of comprehensive
7 approach.

8 Maybe I'm not making myself very clear, but
9 the fact that we can be free to look at every aspect of
10 the flight control system is refreshing.

11 MR. PHILLIPS: I have no further questions.
12 Thank you.

13 CHAIRMAN HALL: Thank you, Mr. Phillips. As
14 always, you did a good job in getting out the concerns
15 that I had. And I apologize for jumping in but this is
16 important work.

17 And before I turn it over to the parties, I'm
18 pleased to hear that you got free rein to get into it
19 and do your very best with your team.

20 THE WITNESS: Thank you.

21 CHAIRMAN HALL: Are there questions from the
22 parties?

1 I see Airline Pilots Association and
2 Boeing. All right.

3 Is it Mr. McGrew? With the Boeing
4 Corporation.

5 MR. MCGREW: Yes. Thank you, Mr. Chairman.

6 Mr. Zielinski, how many Boeing engineering
7 people did you have supporting you? Do you recall?

8 THE WITNESS: In direct support, the people
9 that I've seen from time to time, I believe we've had
10 about 10 people, maybe 15 people at a time. I'm sure
11 there's a lot of people behind the scenes that we
12 haven't talked to directly that have been putting
13 together information in support of the activity, and
14 that's a very difficult thing to estimate.

15 MR. MCGREW: And in addition, was the
16 maintenance training that was provided for your group,
17 was that beneficial?

18 THE WITNESS: Couldn't have done it without
19 it. It was necessary to make the team members familiar
20 with the design, design concepts and approach to
21 maintenance.

22 MR. MCGREW: And am I correct in recalling

1 that you did state that you received all of the data
2 and the information that you needed to accomplish your
3 task?

4 THE WITNESS: Everything we've asked for
5 we've obtained from Boeing.

6 MR. MCGREW: Thank you very much.

7 No further questions, Mr. Chairman.

8 CHAIRMAN HALL: All right.

9 Captain LeGrow with the Airline Pilots
10 Association.

11 CAPTAIN LeGROW: Thank you, Mr. Chairman.

12 Good afternoon, Mr. Zielinski.

13 THE WITNESS: Yes, sir.

14 CAPTAIN LeGROW: Just a couple of quick
15 questions. Was the critical design review team for the
16 Boeing 737 a direct result of the USAir 427 and United
17 Airlines 585 accidents?

18 THE WITNESS: I think it had a very
19 significant influence in our doing this and it was the
20 FAA's attempt to assure itself that nothing's been
21 overlooked.

22 CAPTAIN LeGROW: Thank you. Also, you

1 mentioned that there was an NTSB member assigned to
2 this team. Is this unusual to have a member of the
3 NTSB staff assigned to a critical design review team?

4 THE WITNESS: I can't speak to the formation
5 of the other teams; that is, the critical design review
6 teams. Although this has been my second experience
7 with an NTSB representative, and I found it to be very
8 helpful.

9 CAPTAIN LeGROW: Thank you. In a
10 coordinator's meeting in December at Seattle, we
11 received a report from the NTSB member on the critical
12 design review team and he informed us at that time that
13 that report would be ready for this public hearing.
14 And I think that most of the parties are quite
15 disappointed that we don't have it.

16 Could you briefly tell us what has been the
17 delay? And if I understand your testimony, we're
18 looking at sometime in March before this document is
19 prepared.

20 THE WITNESS: We did have that schedule in
21 mind. It was our hope that we could have the document
22 complete by this time. In fact, a week prior to the

1 hearing, we thought it would be beneficial to the
2 effort, but we just couldn't get our act together.
3 There was a lot of data that needed to be reviewed and
4 reduced and we were still struggling with some of the
5 issues.

6 It was a goal that we had in mind, but as --
7 like I said, the freedom that management has given us,
8 they said, well, if you need more time, take it. Might
9 as well do a good job the first time around rather than
10 have to patch it up later on.

11 We did make an effort to do as you had heard
12 from the NTSB representative, and that's an accurate
13 statement, but we just couldn't complete the task in
14 time.

15 CAPTAIN LeGROW: Thank you. You stated that
16 you had eight people working on this at about 50
17 percent of their time.

18 THE WITNESS: Yes, sir.

19 CAPTAIN LeGROW: Would more manpower have
20 helped to produce this document in time for this public
21 hearing?

22 THE WITNESS: No. More manpower -- the area

1 that it would have helped probably is in word
2 processing. That would have helped a lot. A lot of
3 data. We could have used more help with regard to data
4 reduction and maybe that's the thing that's stalling us
5 the most is reducing the volume of information. I
6 don't think we anticipated the task to be as large as
7 it turned out to be, and that's what delayed our
8 schedule.

9 Yes, we could have used more people. It
10 could have been done on time. As we deliberated with
11 regard -- and are continuing to deliberate our
12 concerns, we find we need more information. That's
13 probably been the biggest problem as far as getting the
14 task complete.

15 CAPTAIN LeGROW: You testified earlier that
16 you've identified certain problems within the controls
17 design of the Boeing airplane or the Boeing 737. Could
18 you please tell us if any of those problems that have
19 been identified are problems that Boeing was unaware
20 of?

21 THE WITNESS: I think I said I identified a
22 number of concerns. These concerns are not necessarily

1 all with respect to design elements. There are some
2 process issues, possibly, from the standpoint of
3 information being transferred from one part of the FAA
4 to another. We have some issues with regard to
5 maintenance and the criticality of certain components,
6 and therefore, the need to assure that maintenance
7 occurs at specific intervals and certain tasks.

8 I believe in some cases what we identified as
9 a concern may have been new to Boeing only because
10 they're out of loop. Particularly, say, in the area of
11 maintenance, for instance, as far as operators
12 conducting inspections and tasks at intervals that are
13 different from the MPD. So we have identified some
14 information that they not have had available, and that
15 was the benefit of the airworthiness people on our
16 team. They accessed information from some of the
17 operators.

18 CAPTAIN LeGROW: Thank you very much.
19 Needless to say, we're looking forward to seeing this
20 document when it's complete.

21 I have no further questions.

22 CHAIRMAN HALL: Thank you, Captain.

1 Mr. Marx?

2 MR. MARX: No questions.

3 CHAIRMAN HALL: Mr. Clark?

4 MR. CLARK: I have no further questions.

5 CHAIRMAN HALL: Mr. Schleede?

6 MR. SCHLEEDE: Yes. A couple of areas.

7 You said the report is coming out toward the
8 end of March. And I thought I heard you say that that
9 would include findings and actions?

10 THE WITNESS: That's correct. It's not
11 enough to say another study needs to be initiated
12 because in some cases our resources aren't enough to
13 thoroughly review a particular aspect. And so we may
14 have a recommendation that says a study has to occur.
15 That study might be the initiation of new regulations
16 or new policy, and so --

17 MR. SCHLEEDE: Well, that's kind of what my
18 question was leading to. When you said actions, I
19 wondered what it was. Are we anticipating rulemaking
20 actions or I mean, is that what you mean? Are you
21 talking about NPRM's?

22 THE WITNESS: Well, that's what I was getting

1 to was that there may be regulatory action required.

2 And so the process, the action plan, should then

3 include or the document should not include an action

4 plan for executing the recommendation.

5 MR. SCHLEEDE: Okay. So your report then, --

6 that's what I -- I misunderstood that. It's not going

7 to come out -- there are not going to be a bunch of

8 NPRM's issued on that day or rulemaking actions.

9 You're going to have an action plan which would list --

10 potentially list --

11 THE WITNESS: Which may be definitely --

12 maybe an AROC needs to be formed to deal with a

13 particular issue.

14 MR. SCHLEEDE: I think you may have been

15 asked this, but if any actions seem to be deemed

16 significant, do you have the wherewithal to bring that

17 out before the end of March?

18 THE WITNESS: Yes. We decided early that if

19 we identified any unsafe condition in our review that

20 we would immediately notify the ACO to take action.

21 MR. SCHLEEDE: And ACO is --

22 THE WITNESS: I'm sorry. Aircraft

1 Certification Office that has the responsibility for
2 the Boeing 737.

3 MR. SCHLEEDE: And the last area. I know you
4 mentioned the Boeing support. What was Boeing's role
5 in relation to the team. Were there Boeing people on
6 the team?

7 THE WITNESS: No. Boeing was providing all
8 the information, answering all the questions, providing
9 the facility. Like I said, the multipurpose cab. They
10 even refrained from arguing that it's extremely
11 improbable. Let's not talk about it.

12 MR. SCHLEEDE: I didn't understand the last
13 part.

14 THE WITNESS: Boeing even refrained from
15 arguing the probability of failure, so we were
16 discussing failures irrespective of their probability.

17 MR. SCHLEEDE: That was a question I had here
18 was probabilities. How were those used. And you say
19 you weren't arguing those?

20 THE WITNESS: That's correct. The exercise
21 is a hazard assessment without at this time regard for
22 probability.

1 MR. SCHLEEDE: And as the report or will the
2 report be presented to Boeing before it's published?

3 THE WITNESS: We're in deliberation with
4 Boeing throughout the process. It's kind of: We need
5 to know this; you give us that; what are your comments.
6 I'm sure the document, and as per our charter, will be
7 coordinated with the Boeing Company as far as action is
8 concerned.

9 MR. SCHLEEDE: I guess I might just ask as
10 far as the subcomponent people like Parker and Dowdy,
11 are they involved in this? Has your team visited their
12 facilities or is it primarily Boeing?

13 THE WITNESS: The reason for visiting people
14 like Parker or Honeywell or Sperry was to get further
15 service history with regard to certain components. But
16 as regards to our findings, no. They're not involved
17 in that.

18 MR. SCHLEEDE: Thank you. That's all I have.

19 CHAIRMAN HALL: Mr. Laynor?

20 MR. LAYNOR: Just a couple, Mr. Zielinski.

21 You may have answered this but out of the
22 eight people that are assigned from the FAA, are they

1 basically engineers from the Certification Office?

2 THE WITNESS: No. They were purposely
3 selected to be folks away from the 737. That is, they
4 had no direct contact or responsibility for the Boeing
5 737 airplane.

6 In fact, three people are from the Southwest
7 Region; one is from New York City Aircraft
8 Certification Office. They were chosen for their
9 expertise and lack of let's say direct affiliation so
10 hopefully there wouldn't be any -- not to say bias, but
11 -- yes, that's okay; we've look at that before -- and
12 ignore the issue. So it was a fresh look with regard
13 to the flight control system.

14 MR. LAYNOR: But they did have the types of
15 engineering expertise to look at systems and such?

16 THE WITNESS: Yes, sir.

17 MR. LAYNOR: Was it basically a design review
18 and looking at the design of the system? I think you
19 mentioned you did look at service history and how that
20 was filtered in. Were they just safety of flight
21 service history or are we looking at all kinds of --

22 THE WITNESS: It was not limited in any way.

1 We were free to challenge the applicability of our own
2 regulations. Thirty years have passed since the
3 original certification of the airplane and technology
4 has changed. So have our regulations and policy and
5 methods of compliance. And so those kinds of things
6 have been reviewed and identified as appropriate, as
7 well as maintenance.

8 When we're talking about failures, you're
9 concerned about the maintenance inspection tasks and
10 intervals, so that's part of the issue. And in fact,
11 it might even involve flight crew training with regard
12 to concerns about upsets.

13 MR. LAYNOR: So we had operational people
14 assigned also?

15 THE WITNESS: That's correct. Operations,
16 airworthiness, flight test and systems people.

17 MR. LAYNOR: And in responding to Captain
18 LeGrow, you said that part of the reason for the delay
19 in the reprogramming schedule out to March was the
20 quest for more information. Can you give me an idea of
21 what kind of information we're still looking for?

22 THE WITNESS: Well, I think, as I said, we're

1 still reviewing the amount of data that we have.
2 There's some additional information that's due to be
3 available to the team from Boeing I believe it was
4 mentioned -- well, it's really February 7th. So we're
5 planning on having a team meeting with the Boeing
6 Company at that time to collect what additional
7 information is necessary.

8 MR. LAYNOR: And who will your
9 recommendations be submitted to?

10 THE WITNESS: Our recommendations will be to
11 the manager of the Transport Airplane Directorate, Mr.
12 Ron Woshner. And that plan then will be executed by
13 the certificate holding office or for that matter, his
14 own organization with regard to any rulemaking or
15 policy changes that might be necessary.

16 MR. LAYNOR: Thank you, sir. That's all I
17 have.

18 CHAIRMAN HALL: Mr. Zielinski, who initiated
19 this review?

20 THE WITNESS: I believe it was Mr. Don Riggan
21 and Mr. McSweeney that saw the need for a special effort
22 to take a fresh look at the flight control system and

1 hopefully identify things that may have been
2 overlooked.

3 CHAIRMAN HALL: And could you identify their
4 titles for us?

5 THE WITNESS: Oh, I'm sorry. Mr. Don Riggan
6 is seated at the Federal Aviation Administration table.
7 He is the manager of the Aircraft Certification Office
8 in Seattle, Washington, and Mr. McSweeny is the manager
9 of the Aircraft Certification Service.

10 CHAIRMAN HALL: And did they give you a
11 letter or a piece of paper directing what you were
12 supposed to -- your role and responsibility, what the
13 group is supposed to perform, accomplish, et cetera?

14 THE WITNESS: No, sir. Charter was developed
15 and signed by Mr. Ron Woshner.

16 CHAIRMAN HALL: Is that part of the record,
17 Mr. Phillips?

18 THE WITNESS: I certainly could make that
19 available.

20 MR. PHILLIPS: I haven't seen an copy of it.
21 We would request that for the docket.

22 CHAIRMAN HALL: Mr. Zielinski, the Captain

1 was not the only one that was disappointed that we
2 weren't going to have your report for this hearing. If
3 that report were available, would you have had any
4 reluctance in presenting it?

5 THE WITNESS: No.

6 CHAIRMAN HALL: If we reconvene this hearing
7 at a later date in Washington to present your report to
8 these parties to this investigation, would you or your
9 -- if you can't answer let me know. Would you or
10 anyone in the FAA have any problem with coming and
11 providing -- presenting the report?

12 THE WITNESS: No, sir. No problem.

13 CHAIRMAN HALL: Is that correct, Mr. Donner?
14 I always like to grab anybody with a title.

15 MR. DONNER: I'd be happy to answer you if I
16 had a microphone.

17 CHAIRMAN HALL: We need a microphone for Mr.
18 Donner in the FAA.

19 MR. DONNER: Mr. Chairman, that report will
20 be a public document and you and anyone else in the
21 room will be welcome to have a copy of that.

22 CHAIRMAN HALL: I knew that was the case but

1 I just wanted to -- you hadn't participated enough,
2 Bud, so I want to be sure we got you on the record.

3 MR. DONNER: I'm waiting for you to ask me
4 about our 727.

5 (Laughter.)

6 CHAIRMAN HALL: Well, while I'm at it, do you
7 mind if we can use your 727 for these tests that Mr.
8 Haueter is going to -- is talking about?

9 MR. DONNER: Yes, sir. I called at lunch
10 today. It's at the Tech Center in Atlantic City and
11 it's available to you at any time you want it.

12 CHAIRMAN HALL: Mr. Haueter, did you get that
13 information? Good enough.

14 Well, we'll try to include that on our wrap-
15 up tomorrow of things that we're going to try -- make a
16 list and be sure we're doing everything we need to do.

17 Mr. Zielinski, did you -- and if this is
18 premature, but have you been able to form any opinion
19 of the adequacy of the Boeing data collection system in
20 terms of do you think that everything is getting
21 reported and getting properly analyzed?

22 THE WITNESS: I think, as I said, if we asked

1 for it, we get it. If we don't ask for it, we may not
2 get what we need. And I think, based on what we've
3 collected so far, there doesn't appear to be any lack
4 of information. I think that's one of the issues
5 that's caused a difficulty in our getting our task
6 completed is that there is an abundance of information.

7 Unfortunately, what's difficult about it is
8 it's not always easily digestible nor is it necessarily
9 clear and it may tell you something and it may not tell
10 you anything, but it is a report. And in some cases
11 the SDR's are basically an indication of a concern but
12 not a solution whatsoever.

13 And so if anything needed to be fixed, clear
14 reporting, concise information I think is essential to
15 any kind of study review analysis. It's not enough to
16 say you take a primary control unit off and not find
17 out if there is anything wrong. So, if there's any
18 deficiencies it's with regard to the content of some of
19 the reporting systems.

20 CHAIRMAN HALL: Well, I will indulge myself
21 with an observation here, and that is we have seen a
22 great deal of technology in this country that in the

1 last 10-15 years that generates a whole lot of data,
2 and I think all of us can make improvements. That
3 includes the Board itself. We get a whole lot of data
4 that I've seen in our Board in the general aviation
5 area that I hope that we're going to be able to
6 structure and analyze better to pinpoint.

7 So I think everybody can do a better job and
8 it's unfortunate that sometimes an event such as this
9 gives everybody a chance to kind of soul search. But
10 we're looking forward very much to your report and
11 while I want to see the report, I'm sure you and all
12 the folks at the FAA want to be sure that everything's
13 done correctly.

14 And so if you don't feel like you're ready to
15 give it, then I certainly don't fault you for that. But
16 I certainly hope that as timely as it can be that it's
17 available and it would -- I obviously rely very much on
18 the advice of the people that are here at this table
19 and the people at that table, but I think if we are
20 still at the same stage of this process when that
21 report is available, we may want to reconvene this
22 hearing and hear from you on that report, sir.

1 THE WITNESS: Yes, sir.

2 CHAIRMAN HALL: Are there other questions
3 from the parties? Anyone at the table?

4 (No response.)

5 If not, sir, you're excused. Thank you very
6 much for your testimony.

7 (Witness excused.)

8 CHAIRMAN HALL: The next witness is -- I will
9 not make any comments, but I have a request here from
10 my people at the table to take a break. We're now at
11 3:30 and we will reconvene at 3:45.

12 (Whereupon, a recess was taken.)

13 CHAIRMAN HALL: We will reconvene this
14 hearing. During the break I hope everyone, all the
15 parties, have received the correspondence I referred to
16 earlier.

17 The next witness is Mr. Kenneth Frey. He is
18 a Boeing 737 Systems Certification Engineer with the
19 Federal Aviation Administration in Seattle, Washington.

20 (Witness testimony continues on the next
21 page.)

1 KENNETH FREY, B-737 SYSTEMS CERTIFICATION ENGINEER,
2 FEDERAL AVIATION ADMINISTRATION, SEATTLE,
3 WASHINGTON

4 (Whereupon,
5 KENNETH FREY,
6 was call as a witness by and on behalf of NTSB, and,
7 after having been duly sworn, was examined and
8 testified on his oath as follows:)

9 CHAIRMAN HALL: Welcome, Mr. Frey. Mr.
10 Schleede will begin the questioning.

11 MR. SCHLEEDE: Mr. Frey, give us your full
12 name and business address for the record, please?

13 THE WITNESS: Kenneth Frey, Federal Aviation
14 Administration, 1601 Lynd Avenue Southwest, Seattle,
15 Washington.

16 MR. SCHLEEDE: Thank you. And what is your
17 present position with the FAA?

18 THE WITNESS: I'm an engineer in the Systems
19 and Equipment Branch.

20 MR. SCHLEEDE: Would you give us a brief
21 description of your background and education that

1 qualifies you for your present position?

2 THE WITNESS: I have a bachelor of science
3 degree in mechanical engineering. I have 4-1/2 years in
4 the Propulsion Group at Tinker Air Force Base and 1-1/2
5 years as the Air Force plant representative in Seattle,
6 Washington as a project engineer and now have just over
7 four years in the Federal Aviation Administration.

8 MR. SCHLEEDE: Thank you very much.

9 Mr. Phillips?

10 MR. PHILLIPS: Thank you.

11 Good afternoon, Mr. Frey.

12 Could you describe what your daily duties are
13 as an engineer in the Seattle ACO?

14 THE WITNESS: Our primary function is to
15 review design data for type certificates for airplanes
16 to ensure it complies with the Federal Aviation
17 requirements. We also take a look at service
18 difficulty reports and service bulletins and various
19 other type data that comes in from Boeing. We deal
20 with supplemental type certificate applicants, preview
21 data for applicants who are making modifications to
22 airplanes.

1 We work and approve data for part
2 manufacturing approvals per 21.303. Frequently we --
3 not so frequent, I guess, but occasionally we have to
4 go out and do some audits in manufacturing facilities
5 to support the manufacturing district inspection
6 office.

7 There's probably other duties. I can't think
8 of them all.

9 MR. PHILLIPS: It sounds like enough to keep
10 you busy right there.

11 What do you spend most of your time doing?
12 Do you do most of your time reviewing service
13 difficulty reports or --

14 THE WITNESS: Recently I've spent a lot of
15 time spent as a participant in this accident
16 investigation. We also have a major certification
17 program going on on the triple 7 airplane. Another
18 duty I'm assigned is mechanical system focal point for
19 the triple 7, so I have to coordinate activities on
20 that program with the other group members in our
21 branch.

22 And so those two things occupy a lot of time.

1 MR. PHILLIPS: When you're provided data from
2 Boeing to review in support of certification or design
3 changes, are you the only person in the FAA office who
4 reviews that data?

5 THE WITNESS: Specific data or --

6 MR. PHILLIPS: Well, let's say that a major
7 design change is being made to the airplane. Would you
8 be a person in the FAA who would review that data and
9 also, would anyone else look at it, too?

10 THE WITNESS: No. We usually work major
11 design changes as a group activity. We bring in the
12 specialists who are most familiar with the type of
13 changes that are being done. We also, -- usually some
14 of those type changes would involve structures and the
15 structures group would have to be involved as well.

16 MR. PHILLIPS: I notice that your name
17 appears on the AD we've talked about in some earlier
18 testimony modifying the main rudder PCU for the servo
19 valve. You were involved with that AD?

20 THE WITNESS: Yes, I was.

21 MR. PHILLIPS: Could you tell me how an AD is
22 created? How do you begin an AD and what does it take

1 to write an AD?

2 THE WITNESS: First, an AD has to be
3 considered to be unsafe or a problem would have to be
4 unsafe before an AD could be written. So once you
5 identify a problem like that, it depends on how it
6 comes in. If it's a Boeing, if there's some
7 information coming from a Boeing service bulletin that
8 needs to be implemented or mandated on airplanes, then
9 we would review that. And then we would probably go
10 ahead and talk to our first level supervisor and
11 discuss that problem with him.

12 And then we're required to go up in front of
13 the managers of the various branches in the office and
14 present the problem and then they would make the
15 decision as to write an AD or not.

16 If they make the decision to write an AD, we
17 go back and start working on it and it gets routed back
18 through the managers for signature and sent upstairs to
19 the Transport Directorate for a final signature and
20 then sent to Washington. And I think after that it gets
21 published in the Federal Register.

22 MR. PHILLIPS: If you were advised or were

1 aware of an item that in your estimation required an AD
2 and would take you to the review group and they said
3 no, is that the end of the line? Do you have any
4 options for getting it reconsidered as an AD?

5 THE WITNESS: You can persuade, if you feel
6 strong enough about it. I feel our managers are pretty
7 conservative and make that decision, but I could not
8 write an AD without management coordination. It has to
9 go through a signature process.

10 MR. PHILLIPS: Does it happen very often that
11 they say no?

12 THE WITNESS: No, it doesn't.

13 MR. PHILLIPS: What process of reviewing
14 service bulletins and information that comes through
15 your hands, what guidelines are you given for
16 determining whether it needs to be carried to a higher
17 level?

18 THE WITNESS: A higher level, as in --

19 MR. PHILLIPS: Such as an AD.

20 THE WITNESS: It's very specific in the
21 FAR's. You need to have an unsafe condition. An unsafe
22 condition has to be -- like it has to be on other

1 airplanes of the same type design.

2 MR. PHILLIPS: When the decision is made to
3 begin work on an AD, is there discussion of economic
4 considerations or impact upon the fleet?

5 THE WITNESS: Part of an AD process is to do
6 an economic analysis and it gets published in an
7 airworthiness directive as well.

8 MR. PHILLIPS: Is that economic analysis done
9 by you or other people within your group?

10 THE WITNESS: Usually, we try to get the best
11 information we can and put that together.

12 MR. PHILLIPS: Economic analysis isn't the
13 sole --

14 THE WITNESS: Well, I want to clarify. I
15 guess that's cost to the operators for implementing the
16 AD. That's specifically what we try to obtain.

17 MR. PHILLIPS: If it was prohibitively
18 expensive, would that keep a safety related AD from
19 being issued?

20 THE WITNESS: No. No, it wouldn't. I believe
21 the -- I don't really know what the whole purpose of
22 that is, I guess. I believe it's in determining

1 whether an AD is major or minor, but I think a major is
2 very expensive and I don't know anybody that's written
3 one.

4 MR. PHILLIPS: And specifically when you
5 wrote the AD for the modifications to the main rudder
6 PCU, what instigated, what began your work in that AD?

7 THE WITNESS: I believe that's the -- I think
8 the NTSB safety recommendation had already come in so,
9 following up on that, a safety recommendation to
10 implement a design change in the main rudder PCU servo
11 valve. I think that's the one we're talking about,
12 correct?

13 MR. PHILLIPS: That's correct.

14 THE WITNESS: Yes.

15 MR. PHILLIPS: When you get a safety
16 recommendation from the NTSB, are you the first person
17 that sees it or is it given to you?

18 THE WITNESS: No. It comes down through to
19 the management chain and then it gets sent to --
20 assigned to an engineer to look at. At least -- it
21 depends on how complex the safety recommendation is.
22 More than one task, more than one person may be working

1 on that.

2 MR. PHILLIPS: Is there any importance given
3 to the task because it comes from an NTSB
4 recommendation is the general consensus it should be
5 done if it comes from the NTSB?

6 THE WITNESS: We take the NTSB safety
7 recommendations very seriously, so there is a high
8 priority. We would have to evaluate how critical it is
9 and work it and prioritize it. But if it's a known
10 unsafe condition, then we would move out on it pretty
11 fast.

12 That's probably one of the highest priority
13 things we do in the office I guess.

14 MR. PHILLIPS: I see. That's good to hear.

15 Are you part of the process in responding --
16 once the NTSB writes a safety recommendation and issues
17 it to the FAA, there's a time clock that starts ticking
18 for a response to the recommendation. Are you part of
19 that process?

20 THE WITNESS: I don't set times. No.

21 MR. PHILLIPS: But would they come to you for
22 an initial assessment as to whether it's a viable AD or

1 not?

2 THE WITNESS: I would be part of the decision
3 on that. Yes. A viable recommendation, I should say,
4 rather than an AD.

5 MR. PHILLIPS: And the NTSB made a
6 recommendation concerning standby rudder galling
7 wherein I believe an advanced notice of proposed
8 rulemaking was issued and then subsequently withdrawn.

9 Were you involved in that process?

10 THE WITNESS: Yes, I was.

11 MR. PHILLIPS: Do you have any comments?
12 Could you describe your recollection of the events
13 related to that recommendation process?

14 THE WITNESS: That was a while back, but from
15 what I can recall is we thought originally that that
16 would be undetectable or it would be hard to detect, so
17 we went ahead and put out the NPRM. And later we
18 reevaluated that and we believe it is a detectable
19 condition.

20 MR. PHILLIPS: So that reevaluation was
21 prompted by -- was it prompted by any particular person
22 or party?

1 THE WITNESS: To the supervisor, I guess.

2 Well, once you have an NPRM you have to follow up with
3 a final rule and review the comments and it was in that
4 process that we determined to withdraw it.

5 MR. PHILLIPS: So the comment period during
6 the NPRM process does provide you guidance for the
7 final rule issuance?

8 THE WITNESS: We have to consider the
9 comments.

10 MR. PHILLIPS: And anyone, any person from
11 the public, any operator can make comments to that
12 rule?

13 THE WITNESS: Anybody can comment to the
14 docket. Yes.

15 MR. PHILLIPS: Do comments carry more weight
16 if they come from the NTSB or a pilot?

17 THE WITNESS: I can't say that comments -- we
18 have to consider them all. I don't know if they're
19 weighted, I guess. We have to make the decision to
20 either write it or not and so we consider everybody's
21 comments.

22 MR. PHILLIPS: The manufacturers such as

1 Boeing or Parker would also -- or Dowdy in that case
2 would be part of the process of commenting?

3 THE WITNESS: They could if they commented.
4 Yes.

5 MR. PHILLIPS: Do they carry any more
6 influence than any other comment that you would
7 receive, in your opinion?

8 THE WITNESS: Not necessarily. We're just
9 trying to gather data and make the decision.

10 MR. PHILLIPS: Along those lines of gathering
11 data and working with manufacturers, in your position,
12 do you generally have free open access to all the data
13 you need to do your job?

14 THE WITNESS: I believe so, yes.

15 MR. PHILLIPS: There's no restrictions that
16 you're aware of areas of inquiry, if you want to go a
17 step further than has been made available to you?

18 THE WITNESS: No. We obtain enough data to
19 make the decision.

20 MR. PHILLIPS: In the course of doing your
21 job, have you been provided any additional training by
22 manufacturers to better do your job?

1 THE WITNESS: Training is available through
2 contract, I guess. It's paid for by the FAA, so --

3 MR. PHILLIPS: Do you receive specific
4 training from Boeing on specific systems and aircraft?

5 THE WITNESS: You can.

6 MR. PHILLIPS: Do you work with the other
7 certification officer at the branch in Long Beach?

8 THE WITNESS: Yes. Occasionally we call them
9 and consult them on certain items and issues.

10 MR. PHILLIPS: In your introduction, your
11 earlier testimony, you stated that you have mechanical
12 system design responsibility or review responsibility
13 for the triple 7. What areas are you responsible for
14 in the 737?

15 THE WITNESS: I'm a backup on the flight
16 control system. My primary responsibility is the
17 pneumatic systems in the FAA.

18 MR. PHILLIPS: You've been involved in the
19 accident investigations of both Colorado Springs and
20 Pittsburgh. Could you first of all describe your
21 initial involvement with the Colorado Springs
22 investigation?

1 THE WITNESS: My initial involvement was when
2 parts were being brought into the Boeing Equipment
3 Quality Assurance Lab and being examined and taken
4 apart and tested after the accident, I guess.

5 MR. PHILLIPS: Did you at that time know that
6 there was something that needed to be changed on that
7 particular unit?

8 THE WITNESS: No, sir. No. You're talking
9 about unsafe --

10 MR. PHILLIPS: Yes. Anything that affects the
11 safety of flight?

12 THE WITNESS: Not at the time that the parts
13 were being brought into the Boeing EQA lab.

14 MR. PHILLIPS: Did you participate in any
15 other aspects of the investigation in Colorado Springs?

16 THE WITNESS: Yes, I did.

17 MR. PHILLIPS: And what group was that with?

18 THE WITNESS: When the United Airlines PCU
19 came in, it had the out of tolerance condition in the
20 secondary slide. We didn't know that at the time but
21 United Airlines reported a jammed hydraulic PCU in
22 their test bench and actually, I think that was jammed

1 on the -- as the pilot was doing a control input check
2 on the airplane, and United, if I recall right, they
3 had a reversal in their test bench. And that was later
4 sent to the Parker Hannifin facility and the NTSB was
5 there for that investigation and I was also a part of
6 that investigation at the Parker facility on that unit.

7 MR. PHILLIPS: Do you recall during any of
8 the testing that you saw of the Colorado Springs -- did
9 you see the testing of the Colorado Springs unit?
10 That's the serve valve.

11 THE WITNESS: I believe that was after --
12 either at the time or after the unit. I'm going to
13 call it the MacMore unit because that's been commonly
14 referred to in previous testimony, so I was there for
15 the testing of the Colorado Springs servo valve at
16 Parker's facility. Yes.

17 MR. PHILLIPS: Did you ever see a reversal of
18 that unit during the testing?

19 THE WITNESS: Not on the Colorado Springs
20 unit, no. Only on the MacMore unit.

21 MR. PHILLIPS: Were you part of the test
22 plan? Were you involved in deciding how the unit would

1 be tested?

2 THE WITNESS: Yes. That was a group
3 consensus of all the participating parties at that time
4 on what was to be done on the units.

5 MR. PHILLIPS: After that testing or since
6 that time, have you been aware of a report of any
7 reversal of the main rudder PCU on the 737 aircraft?

8 THE WITNESS: Would you repeat that?

9 MR. PHILLIPS: Are you aware of any other
10 reversals of the rudder, main rudder PCU on Boeing 737
11 aircraft?

12 THE WITNESS: No. I'm not.

13 MR. PHILLIPS: Have you been involved in the
14 Boeing 747 incident which was testified to earlier this
15 morning?

16 THE WITNESS: I'm aware of it but I have not
17 been involved in it, no. I wanted to attend meeting
18 but I never was able to attend any meetings or
19 briefings on that, so --

20 MR. PHILLIPS: Was that because of scheduling
21 conflicts?

22 THE WITNESS: Yes. I had problems with the

1 scheduling of that.

2 MR. PHILLIPS: There is someone in your
3 office following those developments?

4 THE WITNESS: Yes, there is.

5 MR. PHILLIPS: Are you aware of any -- this
6 may be an unfair question but are you aware of any
7 pending airworthiness directive actions in regards to
8 that Boeing 747 incident?

9 THE WITNESS: I don't know the status of some
10 things. They may be in a rulemaking process now. I
11 would be afraid to talk about it. I'm not sure of the
12 ex parte communication rules.

13 MR. PHILLIPS: Okay. That's fine.

14 THE WITNESS: I don't want to get in trouble
15 here.

16 MR. PHILLIPS: I was just curious if you had
17 any first hand knowledge of what was happening there.

18 Were you involved in the investigation of the
19 USAir 427 accident in Pittsburgh?

20 THE WITNESS: Yes, I was.

21 MR. PHILLIPS: And as part of what group?

22 THE WITNESS: I was in the Systems Group.

1 MR. PHILLIPS: And what was your first
2 participation in the accident?

3 THE WITNESS: I showed up the Saturday
4 morning after the accident, the first Saturday morning
5 after the accident. I believe it was September 10th.

6 MR. PHILLIPS: Is that your first time to an
7 accident scene?

8 THE WITNESS: Yes, it was.

9 MR. PHILLIPS: Could you give us a brief
10 description of what you observed when you initially
11 walked into the accident scene?

12 THE WITNESS: It was a very bad accident, a
13 very broken up airplane and there was fire damage. It
14 took me back, to be honest. I had never walked into
15 something like that before.

16 Do you have any specifics you want me to
17 describe?

18 MR. PHILLIPS: That's a good start. I'd like
19 to know what activities you became involved with at
20 that point and what your participation in the
21 investigation was.

22 THE WITNESS: Basically, I observed the

1 systems team and tried to assist when I could, the
2 team, as they were measuring the -- trying to locate
3 hydraulic components and systems components and take
4 measurements in the field. We spent, I believe, two or
5 three days doing that.

6 MR. PHILLIPS: Did that add any insight to
7 the job that you do normally as a certification
8 engineer?

9 THE WITNESS: I'd say it was a very
10 interesting experience, I guess. It makes me more
11 aware.

12 MR. PHILLIPS: The investigation after we
13 left the accident site went into quite a bit of
14 testing. Were you a part of that testing?

15 THE WITNESS: Yes, I was.

16 MR. PHILLIPS: And have you seen anything in
17 that testing that would make you feel that there's
18 immediate action required on the FAA's part as far as
19 airworthiness directives or --

20 THE WITNESS: From testing of the USAir
21 components?

22 MR. PHILLIPS: That or any of your other

1 observations of the investigation.

2 THE WITNESS: No, sir.

3 MR. PHILLIPS: Do you have any
4 recommendations for additional areas of testing or
5 concerns you may have to further the investigation?

6 THE WITNESS: I'm not certain. I guess I --
7 there's some things I probably want to discuss with the
8 systems group but it might be premature to try to
9 comment on them at this time, I guess. I would rather
10 do that within the forum of the systems team members.

11 MR. PHILLIPS: Okay. Which you're a part of.
12 Are you familiar with the CDR group that Mr.
13 Zielinski spoke of earlier?

14 THE WITNESS: Yes. I know it exists.

15 MR. PHILLIPS: Have you provided any support
16 for their investigation or their work?

17 THE WITNESS: I briefed them on the main
18 rudder PCU AD one afternoon.

19 MR. PHILLIPS: And one final question. Do
20 you have any observations from your position as to the
21 adequacy or inadequacy of the amount of FDR data that's
22 been collected on the aircraft?

1 THE WITNESS: I think if we had more
2 parameters on this airplane, we could certainly narrow
3 the focus of the investigation.

4 MR. PHILLIPS: I have no further questions.

5 CHAIRMAN HALL: Do any of the parties have
6 questions for this witness?

7 I see the Airline Pilots Association.

8 Anyone else?

9 (No response.)

10 If not, Captain LeGrow.

11 CAPTAIN LeGROW: Thank you, Mr. Chairman.

12 Good afternoon, Mr. Frey.

13 Just one or two questions. You testified to
14 some questions from Mr. Phillips about the AD that was
15 issued on the main rudder power control unit on the
16 737. Could you elaborate a little bit more? I believe
17 you testified that you felt it needed some design
18 changes. Could you be a little bit more specific in
19 exactly what those changes were on the AD?

20 THE WITNESS: The changes were it's required
21 to fix a tolerance condition in the secondary slide to
22 prevent it from overtraveling its internal stop. The

1 AD corrects that overtravel condition.

2 CAPTAIN LeGROW: Thank you. Could you tell
3 us please if that AD has been completed on the fleet?

4 THE WITNESS: I periodically check up on the
5 status of the numbers of PCU's that's been overhauled
6 for the U.S. fleet and right now I believe it's between
7 one-third and one-half of the U.S. fleet has been
8 modified.

9 CAPTAIN LeGROW: Did the FAA put a time limit
10 on when the fleet must be complete?

11 THE WITNESS: It has to be completed within
12 five years of issuance date of the AD.

13 CAPTAIN LeGROW: So I'm to understand that
14 the airworthiness directive was issued for a safety --
15 important safety issue and the FAA has given five years
16 to have the AD complied with?

17 THE WITNESS: Yes, sir.

18 CAPTAIN LeGROW: Thank you. I have no
19 further questions.

20 CHAIRMAN HALL: Any questions from any of the
21 other parties?

22 Mr. Marx?

1 MR. MARX: No questions.

2 CHAIRMAN HALL: Mr. Clark?

3 MR. CLARK: No questions.

4 CHAIRMAN HALL: Mr. Schleede?

5 MR. SCHLEEDE: Yes, sir, in a couple of
6 areas.

7 Regarding the airworthiness directive
8 process, just briefly, what is the role of the
9 manufacturers such as Boeing and Parker in the
10 processing of an AD? And I characterize that as not
11 the NPRM process but a telegraphic or no notice, no
12 public notice AD.

13 THE WITNESS: I really haven't -- I've never
14 written a telegraphic or immediate adoptive rule, but
15 they're required to give us data, whatever is
16 necessary, to get that AD out. Those are pretty high
17 priority AD's and definitely need immediate attention.
18 So they have to provide that kind of information.

19 And -- well, I can't speak because I've never
20 had to process one of those yet.

21 MR. SCHLEEDE: Okay. And how about Air
22 Transportation Association.

1 THE WITNESS: Pardon me?

2 MR. SCHLEEDE: The Air Transport Association,
3 their involvement? Is there any involvement between
4 your office and the ATA during the AD promulgation?

5 THE WITNESS: Oh, yes. I forgot a step when
6 I was trying to describe the AD process. One of the
7 things I'm required to do is to contact the ATA and let
8 them know that it's coming.

9 MR. SCHLEEDE: You also talked about your
10 office using service difficulty reports. Do you have a
11 personal view as to the quality of the data, the
12 quantity and the quality of the data in the SDR
13 program?

14 THE WITNESS: The data is basically -- it
15 tells you what the flight squawk is and it tells you
16 what the maintenance action is. It does not get you
17 into details of what happened on the component, so
18 you've got to go try to find that out. And sometimes
19 that can be difficult.

20 MR. SCHLEEDE: How do you do that? Is there
21 enough information in there for you to identify the
22 event to track down additional information?

1 THE WITNESS: Oh, yes. Boeing -- I do two
2 things, I guess. Usually when I get something I'm
3 concerned about I'll go back and call Boeing and say,
4 you know, tell me what you know about this incident.
5 And then I also go down to our Aircraft Evaluation
6 Group which is part of the Flight Standards Division of
7 the FAA and start having them contact the airline and
8 try to pull records and learn as much as we can about
9 the incident.

10 MR. SCHLEEDE: Thank you. That's all I have.

11 THE WITNESS: Thank you.

12 CHAIRMAN HALL: Mr. Frey, we appreciate very
13 much your presence here. You're excused.

14 THE WITNESS: Thank you.

15 CHAIRMAN HALL: I'm sorry. Would you hold a
16 moment?

17 Yes, sir?

18 MR. MCGREW: Could we have one question,
19 please?

20 CHAIRMAN HALL: Surely. Surely.

21 MR. MCGREW: Mr. Frey, during this period
22 that the aircraft are flying and have not yet been

1 refitted with the modified PCU's, the pilots are still
2 performing their preflight checks, I presume?

3 THE WITNESS: I didn't understand the
4 question.

5 MR. MCGREW: The pilots are still performing
6 their preflight checks I presume in this period while
7 the aircraft have not yet been refitted with the
8 modified PCU valve?

9 THE WITNESS: As far as I understand,
10 preflight checks are required for all airplanes.

11 MR. MCGREW: And I understand -- am I correct
12 in understanding that the terminating action to this AD
13 is indeed -- the AD requiring the 750 hour check is
14 indeed the installation of the revised PCU?

15 THE WITNESS: The terminating action is to --
16 so you don't have to do the 750 hour check is to modify
17 the PCU.

18 MR. MCGREW: Thank you. I didn't say that
19 right. Thank you very much.

20 That's all, Mr. Chairman.

21 CHAIRMAN HALL: Thank you. You're excused.

22 (Witness excused.)

1 CHAIRMAN HALL: Mr. Thomas McSweeney who is
2 the Director of the Aircraft Certification Service for
3 the FAA was scheduled to be our next witness.
4 Regretfully, Mr. McSweeney has a serious illness in his
5 family and is unable to be here.

6 The FAA is providing a witness who will
7 attempt to address some of these areas that Mr.
8 McSweeney was going to address, Mr. Don Riggan.

9 Mr. Riggan, we appreciate your presence on
10 short notice.

11 (Witness testimony continues on the next
12 page.)

1 DONALD RIGGIN, MANAGER, SEATTLE AIRCRAFT CERTIFICATION
2 OFFICE, FEDERAL AVIATION ADMINISTRATION,
3 RENTON, WASHINGTON

4 (Whereupon,
5 DONALD RIGGIN,
6 was call as a witness by and on behalf of NTSB, and,
7 after having been duly sworn, was examined and
8 testified on his oath as follows:)

9 CHAIRMAN HALL: Welcome, Mr. Riggin. Mr.
10 Schleede will begin the questioning.

11 MR. SCHLEEDE: Mr. Riggin, give us your full
12 name and business address for the record, please?

13 THE WITNESS: Donald L. Riggin, 1601 Lynd
14 Avenue, Southwest, Renton, Washington. That's the FAA
15 Northwest Region Headquarters.

16 MR. SCHLEEDE: And your position with the
17 FAA?

18 THE WITNESS: I'm the Manager of the Seattle
19 Aircraft Certification Office.

20 MR. SCHLEEDE: Could you give us a brief
21 description of your background and education?

1 THE WITNESS: I have a bachelor of science
2 degree is aeronautical engineering from the University
3 of Maryland. I've got 31 years experience with the
4 FAA, all of that in Aircraft Certification.

5 My technical background was as a flight test
6 engineer. For approximately the last 20 years I've
7 been involved in various levels of supervision and
8 management in the Seattle Office.

9 MR. SCHLEEDE: And briefly, what are your
10 areas of responsibilities in your current position?

11 THE WITNESS: As the ACO manager, I'm
12 responsible for the program accomplishment of the
13 Aircraft Certification Office which involves the three
14 primary functions that we do. One is design approvals.
15 The other is continued operational safety which is the
16 umbrella term we use for service difficulty review, AD
17 action, participate in accident/incident investigations
18 and we also assist the Transport Standards Staff in the
19 directorate in the formulation of regulations, policy,
20 standardization issues.

21 MR. SCHLEEDE: And who do you report to in
22 the organizational chain?

1 THE WITNESS: I report to the manager of the
2 Transport Airplane Directorate, Mr. Ronald Woshner.

3 MR. SCHLEEDE: And he's located in the
4 Seattle Office?

5 THE WITNESS: He's located in the same
6 building. Yes.

7 MR. SCHLEEDE: And how long have you worked
8 for the FAA?

9 THE WITNESS: 31 years.

10 MR. SCHLEEDE: And in your current position?

11 THE WITNESS: Current position since 1989.

12 MR. SCHLEEDE: Thank you. Mr. Phillips will
13 proceed.

14 MR. PHILLIPS: Thank you.

15 Good afternoon.

16 Mr. Riggin, the previous testimony was from
17 Mr. Frey. Does he work under your supervision?

18 THE WITNESS: Yes. He's one of the engineers
19 in the Systems and Equipment Branch.

20 MR. PHILLIPS: Could you tell us
21 approximately how big your branch is and what your
22 organizational structure is?

1 THE WITNESS: The Seattle ACO is divided into
2 six branches along technical lines. We have an
3 airframe branch, a systems and equipment, propulsion
4 branch, flight test branch, a branch that works
5 primarily on small airplanes and then we have a
6 technical/administrative support staff.

7 Each of the main branches has at present a
8 supervisory level that is being eliminated as part of
9 our attempt to downsize and flatten the organization.

10 MR. PHILLIPS: What kind of qualifications
11 would you look for as an employee for the systems and
12 equipment branch, for example?

13 THE WITNESS: The minimum qualification for
14 employment in the ACO as an engineer is a degree in
15 engineering. We employ mechanical engineers,
16 electrical engineers, electronic engineers, software
17 engineers.

18 MR. PHILLIPS: Do your engineers typically
19 come from the manufacturers in the local area or
20 anywhere else?

21 THE WITNESS: We do hire from Boeing. We
22 hire from other aeronautical firms in the area. From

1 time to time we'll have people transfer from other
2 ACO's. We also on occasion have the opportunity to
3 hire people directly from college.

4 MR. PHILLIPS: How many other ACO's are
5 there?

6 THE WITNESS: There are 14.

7 MR. PHILLIPS: 14.

8 THE WITNESS: 13-14. I could name them but I
9 can't add them up in my head.

10 Throughout the country and including the
11 office in Alaska and the one in Brussels, I believe he
12 number is 14.

13 MR. PHILLIPS: The responsibility for your
14 ACO organization then goes beyond Boeing Aircraft?

15 THE WITNESS: Yes. We handle all
16 aeronautical product approvals in the states of
17 Washington, Oregon, Idaho, parts of Montana.

18 MR. PHILLIPS: So it's a regional
19 distribution then?

20 THE WITNESS: Geographical distribution.

21 MR. PHILLIPS: Geographical. Are you
22 involved with the Long Beach ACO?

1 THE WITNESS: There's quite a bit of
2 communication between the two ACO's. We both work on
3 large airplane programs and we encourage communication
4 between the technical specialists.

5 I meet frequently with the counterpart manger
6 there as part of my participation in the directorate
7 management team.

8 MR. PHILLIPS: We've had testimony earlier
9 this week about the data collection process of reported
10 safety incidents and accidents. Could you give me a
11 brief summary of the facilities available to you for
12 analyzing accident/incident related data?

13 THE WITNESS: Well, first of all, we get data
14 or the information from a series of sources. First of
15 all is the FAA's SRD system, the reporting system that
16 comes out of FAR 121. We get data directly from Boeing
17 through the 21.3 reports that are required. We get
18 information directly from airlines, directly from the
19 principal inspectors at airlines.

20 We will get information directly from other
21 authorities, and of course we get information through
22 our Accident Investigation Division in Headquarters and

1 also the NTSB.

2 So we get a wealth of data.

3 MR. PHILLIPS: Is there any one group within
4 the ACO that's responsible for distributing that data
5 or tracking it?

6 THE WITNESS: The service difficulty reports
7 that we get in hard copies are farmed out to each of
8 the branches where they're handed off to the individual
9 engineers to review. The FAR 21.3 reports that we get
10 from Boeing come into a focal point in the technical
11 support staff who is our service difficulty AD
12 coordinator who logs it in and then assigns it to the
13 proper branch for action.

14 MR. PHILLIPS: Regarding the investigation of
15 the Colorado Springs and Pittsburgh accidents, were you
16 involved in either one of those two investigations?

17 THE WITNESS: I wasn't directly involved.
18 Provided assistance to the NTSB as requested. In the
19 case of Colorado Springs, we did not have anyone on
20 site but we did have a member of the performance group.
21 In the case of the USAir accident, we sent three
22 engineers on site; two systems engineers and one flight

1 test engineer.

2 My role is primarily keeping track of what's
3 going on. Being aware.

4 MR. PHILLIPS: How is the decision made to
5 supply engineers to the investigation?

6 THE WITNESS: First of all, we do it on
7 request. We don't send anyone unless requested by the
8 NTSB through the Accident Investigation Division in
9 Washington. We would send individuals generally as
10 requested. We would be asked for an airframe engineer
11 or a systems engineer.

12 If there was something about the accident
13 that we were aware of that would make us feel that we
14 should send a certain type of specialist, we would work
15 that back through the loop of FAA Headquarters.

16 MR. PHILLIPS: Is there a system in place for
17 you to be involved in incidents that aren't accidents
18 but come through Mr. Donner's office?

19 THE WITNESS: Yes. It would be the same type
20 of sharing information.

21 MR. PHILLIPS: Sharing information?

22 THE WITNESS: Yes.

1 MR. PHILLIPS: Okay. In regards to the
2 critical design review that Mr. Zielinski spoke to
3 earlier, I heard him mention your name as one of the
4 original founders of that concept. Would you like to
5 tell us in your mind why the CDR was initiated and why
6 at the time it was?

7 THE WITNESS: Shortly after the USAir
8 accident started to come out and the similarities, if
9 you will, in the flight path between it and Colorado
10 Springs, it became apparent to me at least that we
11 might have a common cause here.

12 The engineers in the Seattle ACO have been
13 living with the rudder system on the 737 for several
14 years now and it was my feeling that perhaps they're so
15 close to the problem that perhaps they're missing
16 something. I began to think that it might be a good
17 idea to get an independent group of eyes and minds that
18 aren't familiar with it but are familiar with how
19 systems are assessed and then put a team together.

20 During one of the frequent phone calls we've
21 had with Headquarters following the accident, I threw
22 the idea out on the table with Tom McSweeny and it

1 turns out he had been thinking along the same lines, so
2 we began to formulate who we might have.

3 I developed a draft charter which got some
4 management review and then essentially got it turned
5 over to the team for finalization. We started to go
6 out and look for volunteers from the ACO's and other
7 people. Worked the effort to get members from
8 Transport Canada, Air Force and NTSB involved.

9 MR. PHILLIPS: Mr. Zielinski testified that
10 eight people participated in that review. How did you
11 arrive at the number? Was there any plan that got
12 eight people into the program?

13 THE WITNESS: Once we got to the point that
14 we had pretty much identified where we wanted people
15 from and identified Mr. Zielinski as the team leader, I
16 dropped out. I want that report and the action plan to
17 be completely divorced from any input as much as
18 possible from the Seattle ACO. I want a completely
19 separate review of the system, a separate set of
20 recommendations and action plan.

21 So from the point of time where we had
22 identified a few people and turned the leadership of

1 the team over to Mr. Zielinski, I just wanted the
2 Seattle ACO to back completely away from it.

3 MR. PHILLIPS: So there's been no progress
4 reviews or interim reporting?

5 THE WITNESS: There was one interim review a
6 couple of weeks ago that I attended. I want to not even
7 be involved in reviewing the report if I can avoid it.
8 I hope that -- from my standpoint the ideal situation
9 is the first time the Seattle ACO will see the report
10 is when I get it from my boss, Ron Woshner, with a copy
11 of the action plan and direction to implement the
12 actions that the Seattle ACO is responsible for.

13 Again, I want a completely independent
14 review.

15 MR. PHILLIPS: And you believe that to this
16 point you've gotten a completely independent review?

17 THE WITNESS: As far as the lack of any bias
18 or involvement from the Seattle ACO, yes.

19 MR. PHILLIPS: In your observation of the CDR
20 to date, would you have any recommendations for
21 continuing the CDR beyond the planned time or is it
22 just too premature to answer that question?

1 THE WITNESS: The projected completion date
2 of the end of March is, as far as I know, what the team
3 believes they can honestly do and do a good complete
4 job. And so I believe that's entirely appropriate.

5 MR. PHILLIPS: You don't envision any
6 additional work beyond the end of March then? Any CDR
7 meetings?

8 THE WITNESS: If the CDR team completes the
9 report and submits it, as far as I'm concerned, I
10 guess, they would do their job. It would then be the
11 job of the rest of us to implement whatever the action
12 plan was or is.

13 MR. PHILLIPS: Based on the presentation of
14 the interim findings that you attended a couple of
15 weeks ago, you mentioned, do you have any observations
16 as to whether you're going to get what was expected?
17 Any comments along that line?

18 THE WITNESS: No. I guess I can't put a
19 characterization on that.

20 MR. PHILLIPS: But it is your belief that
21 when the report is published it will be a public
22 document and will be acted on by the FAA as

1 appropriate?

2 THE WITNESS: Yes.

3 MR. PHILLIPS: I don't believe I have any
4 further questions at this time.

5 CHAIRMAN HALL: Thank you, Mr. Phillips.

6 Do any of the parties have questions for this
7 witness?

8 I see the FAA's hand. Mr. Donner?

9 MR. DONNER: Yes, sir.

10 Just one question. In the previous testimony
11 of Mr. Frey, it was brought up that we're allowing five
12 years to complete the AD on the main rudder PCU. Can
13 you tell us how that time was selected?

14 THE WITNESS: The amount of time allowed to
15 incorporate the modified PCU's into the 737 fleet was
16 based to a great deal on the availability of Parker to
17 turn the units around. There's like 2400-2600
18 airplanes and a certain number of spares and you've got
19 to work that through the process.

20 As I recall, the airlines asked for seven
21 years. I think we fixed on five years based on two
22 factors. Number one is the factor of how much Parker

1 could actually get done, and the second thing was the
2 fact that we did have an inspection that could be
3 repeated that would give us an assurance of a level of
4 safety that was satisfactory during the interim time
5 period.

6 If we didn't have that inspection available
7 to us, we would have had to give a lot more
8 consideration for a shorter compliance time.

9 MR. DONNER: Thank you. Thank you, sir.

10 CHAIRMAN HALL: Mr. Riggin, in that sort of
11 situation, have you monitored that during the time
12 period so you don't end up at the end of four years and
13 there's only been a handful of things retrofitted and
14 you've got to extend it again because there isn't
15 enough time?

16 THE WITNESS: The ACO doesn't directly
17 monitor that. We rely on our friends on the Flight
18 Standards side of the house to follow AD compliance.

19 CHAIRMAN HALL: Would you be in a position --
20 you were involved in that; right?

21 THE WITNESS: In the --

22 CHAIRMAN HALL: Five years.

1 THE WITNESS: Yes. As the manager.

2 CHAIRMAN HALL: Do you see any need that that
3 five year period would have any further extensions to
4 it?

5 THE WITNESS: If an airline came in on a case
6 by case basis and asked for an extension of the time
7 and had a reasonable justification for doing it and
8 waiting until the last minute to order parts would not
9 be a reasonable justification, as an example, the AD
10 allows an extension of compliance time if reasonably
11 justified, but it's on a case by case basis.

12 CHAIRMAN HALL: All right. Well, I just --
13 yes. I'm sorry. Captain LeGrow?

14 I'm sorry. The Airline Pilots Association.
15 The Chairman is not in his seat here -- his office.

16 CAPTAIN LeGROW: Thank you, Mr. Chairman. I
17 thought maybe I wore it out.

18 Mr. Riggins, just one quick question. Did the
19 Safety Board in their recommendations set a recommended
20 time limit for AD compliance?

21 THE WITNESS: As I recall the four
22 recommendations, that one of Safety -- that the AD

1 resulted in, only recommended that Boeing develop a
2 modification and that the FAA require the modification
3 by AD.

4 CAPTAIN LeGROW: So the FAA didn't -- I mean,
5 -- excuse me. The Safety Board did not recommend a
6 time line compliance from the AD?

7 THE WITNESS: I don't believe the
8 recommendation specified a time. No.

9 CAPTAIN LeGROW: Thank you. I have no
10 further questions.

11 CHAIRMAN HALL: Thank you. Thank you.
12 Mr. Marx?

13 MR. MARX: I have no questions.

14 CHAIRMAN HALL: Mr. Clark?

15 MR. CLARK: Mr. Riggins, can you describe the
16 certification basis used on the 737 for protecting
17 against single point failure modes that could lead to a
18 catastrophic event, especially related to the rudder
19 package as we see it?

20 THE WITNESS: The certification basis for the
21 original 737, of course, is a very early vintage of
22 Part 25 and at that vintage of Part 25, it was

1 essentially a single failure rule.

2 So, the failure analysis would entail
3 assuming various failures within the control system and
4 evaluating the effect.

5 MR. CLARK: So basically we go back to the
6 system -- failure modes and effect analysis?

7 THE WITNESS: Yes. Back then it would just
8 be called a failure analysis.

9 MR. CLARK: Okay. Can you describe how the
10 ACO is involved in any trend analysis, such as
11 monitoring service difficulty reports or PTR reports?

12 THE WITNESS: And individual engineer, as
13 part of their service difficulty responsibility,
14 oversight responsibility for the areas they're assigned
15 in, if for any reason as part of an evaluation of a
16 system or a component that they felt the need for a
17 trend analysis or historical data, that's certainly
18 available either through the SDR system or through the
19 information that Boeing maintains. So it's something
20 that's available that could be used as a tool on a case
21 by case basis as each engineer sees the need for it.

22 MR. CLARK: Do you have a staff that conducts

1 the trend analysis from available data or is that
2 something you would go to Boeing for? Somebody has to
3 process the data.

4 THE WITNESS: Yes. We would tend to rely on
5 Boeing or we would use the existing SDR system, the 121
6 system.

7 MR. CLARK: The 121 system does its own
8 analysis and provides you an output?

9 THE WITNESS: Yes. We can ask for -- I
10 believe there's various levels of sorts you can get for
11 the data.

12 MR. CLARK: There's been a lot of testimony
13 about flight data recorder parameter lists. And from
14 your perspective, are there any reasons that could
15 prevent us from expanding the parameter list on these
16 new airplanes coming out? There's going to be a two-
17 part question of this and one is going to be certainly
18 retrofit on the new airplanes.

19 THE WITNESS: From Mr. McGrew's testimony
20 this morning, I've already advised him that there is a
21 discrepancy between what he understands is being
22 delivered and what I understand is being delivered

1 because we were specifically asked that question by Mr.
2 McSweeney to develop that type of data.

3 The answer that we got back dealing directly
4 with the DER's that work the flight data recorder, is
5 that all Boeing airplanes that are being delivered and
6 that had been delivered since October of 1991 have all
7 of the parameters required by the present requirements
8 of FAR 121, Appendix B. That is, both the mandatory
9 and the recommended list, plus additional parameters.

10 And there's a discrepancy there between what
11 we got through the Boeing DER system and what Mr.
12 McGrew testified to.

13 MR. CLARK: Basically, what I remember the
14 Boeing testimony to be was the requirement for the 31
15 parameter list. And you're saying that in addition to
16 that, Boeing is putting out the recommended part of the
17 list also?

18 THE WITNESS: Yes. That's the information we
19 got through the DER system.

20 MR. CLARK: Now, turning our attention to
21 retrofit issues, though, are you familiar enough with
22 the basic problems or can you tell me what the problems

1 may be in retrofit issues, to go back --

2 THE WITNESS: Well, the retrofit issues just
3 gets into what is already installed in an airplane and
4 how compatible it would be with an expanded flight data
5 recorder. That's about as far as I could go with that.

6 MR. CLARK: Basically, if we're already
7 looking at it on a QAR, then we should be able to pick
8 it up or it seems very readily on a FDR?

9 THE WITNESS: I'm aware of what QAR's are but
10 I don't consider myself to be a technical expert to
11 confirm that one way or the other.

12 MR. CLARK: Then I have no further questions.
13 Thank you.

14 CHAIRMAN HALL: Let's see. Mr. Marx?

15 MR. MARX: I have no questions.

16 CHAIRMAN HALL: Mr. Schleede?

17 MR. SCHLEEDE: No questions.

18 CHAIRMAN HALL: Mr. Laynor?

19 MR. LAYNOR: Just a couple, Mr. Riggins.

20 In responding to Mr. Clark's questions you
21 mentioned the certification basis for the 737 being
22 early vintage Part 25 which was a single point failure.

1 Can you describe what a single point failure rule means
2 and how it was applied and what a failure analysis
3 would be?

4 THE WITNESS: Well, okay. That's, -- as with
5 my technical background being a flight test engineer,
6 I've actually never done one of those. But as I
7 understand how it's accomplished is that the engineers
8 would go through the control system and just
9 arbitrarily assume failures at certain points and then
10 establish what the effect of those failures is on the
11 system.

12 MR. LAYNOR: And what would be considered
13 permissible?

14 THE WITNESS: Well, no single failure can
15 result in loss of an airplane. That's been a
16 longstanding rule that still exists.

17 MR. LAYNOR: This may be difficult, but you
18 mentioned that it was an early vintage Part 25 rule. I
19 think those were your words. Can you summarize for me
20 the major differences in the certification basis as it
21 would exist today?

22 THE WITNESS: You mean if an airplane were

1 being certified to today's rules?

2 MR. LAYNOR: Applied for a type certificate
3 today under today's rules.

4 THE WITNESS: The primary difference is in
5 the specific regulations that have to do with control
6 systems, 25.671. Those requirements are considerably
7 more extensive and I'm sorry I can't get into the
8 detail, but the requirements are more stringent in the
9 present 25.671 than existed in the original
10 certification basis.

11 Another factor that comes into play is
12 there's now a 25.672 which gets into power operated and
13 stability augmentation devices. And also under today's
14 rules the present version of 25.1309 would come into
15 play also.

16 MR. LAYNOR: Okay. What would the
17 certification basis be for derivative aircraft of the
18 Boeing 737 models?

19 THE WITNESS: When we establish the
20 certification basis for a derivative airplane, in the
21 past we have started at the point where the original
22 model was certified and added amendments based on the

1 changes that were being made to the airplane.

2 In the case of the 737-700, we asked Boeing
3 to take the existing amendment level at the time they
4 applied, which was amendment 77, and come back and
5 justify to us why they should not comply at that level.

6 The result is that airplane will comply at
7 the amendment 77 level with the exception of about 10
8 to 15 sections that we're still debating back and
9 forth.

10 MR. LAYNOR: All right. I'll change the
11 subject just a little bit.

12 We also discussed the review of the SDR
13 system and trend analysis. Can you clarify for me is
14 that automated or does that require initiative on the
15 part of your engineers to go query the system and look
16 for problems, so to speak?

17 THE WITNESS: I believe the process is that
18 we have to go through the office in Oklahoma City and
19 request the information. I don't believe that we can
20 physically do it at our terminals. I could be wrong.

21 MR. LAYNOR: So how does a problem that's a
22 repeated problem that shows up in the SDR system come

1 to the attention of the ACO?

2 THE WITNESS: Well, first of all, the ACO
3 engineer is reviewing the service difficulty reports
4 that we get in hard copy.

5 Okay. So hard copies of the SDR's on a
6 biweekly basis are produced in Oklahoma City as they
7 get reports from the airlines and sent out to the
8 field, so we get those copies, the hard copies.

9 MR. LAYNOR: So, it's kind of based on
10 corporate memory, so to speak. If somebody recognizes
11 that this is a repetitive --

12 THE WITNESS: Yes.

13 MR. LAYNOR: All right. Thank you, sir.

14 CHAIRMAN HALL: Very well.

15 Is there anything else, sir, that you think,
16 Mr. Riggins, you can add? Obviously, as you have
17 testified, based on your concerns and your experience,
18 you initiated a process, one of the people suggested,
19 that initiated this special design review?

20 THE WITNESS: Critical design review.

21 CHAIRMAN HALL: Critical design review that's
22 ongoing. And do you feel -- let me just add on that.

1 The independence of that work has been maintained as
2 you wanted it to?

3 THE WITNESS: Yes.

4 CHAIRMAN HALL: Very well. And is there
5 anything else that you would like to add? Any other
6 areas that this investigation should be looking at that
7 -- I think you've been here for a couple of days. Any
8 suggestions you want to make to us?

9 THE WITNESS: No. I don't believe so. Not
10 at this time.

11 CHAIRMAN HALL: Well, very well. We very
12 much appreciate your testimony.

13 (Witness excused.)

14 CHAIRMAN HALL: We are going to take one more
15 witness today, that is, with Mr. Haueter's direction.
16 Is that, -- Mr. Haueter, is that how you want to
17 proceed?

18 MR. HAUETER: Yes. One more, sir.

19 CHAIRMAN HALL: And I think we will take a
20 break before we hear from the final witness of the day
21 and that is Mr. -- no. Excuse me. Captain Thomas
22 Johnson who is the Director of Training for USAir here

1 in Pittsburgh. So if he would be available when we
2 return, and we will return at 5:15.

3 (Whereupon, a recess was taken.)

4 CHAIRMAN HALL: We'll convene this hearing.
5 We have a couple of administrative announcements.

6 I would like to remind the press that this
7 room will be reversed. It will be smaller, right, and
8 reversed tomorrow, or --

9 MR. HAUETER: Should be about the same size.

10 CHAIRMAN HALL: Same size?

11 MR. HAUETER: Just the other side of the
12 room.

13 CHAIRMAN HALL: Anyway, you need to move your
14 equipment tonight and we apologize for that
15 inconvenience, if it is an inconvenience to anyone and
16 this room will be set up again tomorrow. So if
17 everyone would please remove whatever papers, materials
18 or camera equipment, et cetera, we will have -- this
19 room has to be broken down and set up in a different
20 configuration for tomorrow.

21 Secondly, we will begin tomorrow as we have
22 every day this week other than Monday, at 8:30 a.m.

1 And the first witness tomorrow at 8:30 will be who, Mr.
2 Haueter?

3 MR. HAUETER: Captain Traub.

4 CHAIRMAN HALL: Will be Captain Traub or
5 General Oaks?

6 MR. HAUETER: Captain Traub.

7 CHAIRMAN HALL: So we will lead off tomorrow
8 with Captain William Traub, who is the Vice President
9 for Flight Standards and Training with United Airlines
10 in Denver. Then hear from General Robert Oaks. He's
11 the Vice President for Corporate Safety and Regulatory
12 Compliance with USAir; Captain David Hyde, who is a
13 training pilot with Boeing; and conclude with David
14 Bowden, the principal operations inspector for the FAA
15 in Pittsburgh.

16 So, that gives everybody the schedule for
17 tomorrow and we will now begin with the last witness
18 for today.

19 Welcome, Captain Johnson.

20 (Witness testimony continues on the next
21 page.)

1 CAPTAIN THOMAS JOHNSON, DIRECTOR OF TRAINING, USAIR,
2 USAIR, INC., PITTSBURGH, PENNSYLVANIA

3 (Whereupon,

4 THOMAS JOHNSON,
5 was call as a witness by and on behalf of NTSB, and,
6 after having been duly sworn, was examined and
7 testified on his oath as follows:)

8 CHAIRMAN HALL: Mr. Schleede, if you'd begin
9 the questioning, please.

10 MR. SCHLEEDE: Thank you.

11 Please give us your full name and business
12 address for the record?

13 THE WITNESS: Yes. My name is Thomas, initial
14 E., Johnson, and the business address is Pittsburgh,
15 Pennsylvania.

16 MR. SCHLEEDE: And by whom are you employed?

17 THE WITNESS: I'm employed by USAir, Inc.

18 MR. SCHLEEDE: And what position?

19 THE WITNESS: I'm Director of Flight Training
20 and Standards.

21 MR. SCHLEEDE: Would you give us a brief

1 description of your background and training that
2 brought you to this position?

3 THE WITNESS: I attended Oklahoma State
4 University and -- University. Flight schools at --
5 Oklahoma City State University, Flight Safety
6 Incorporated, Braniff Educational System, Incorporated,
7 and Boeing.

8 As far as background or FAA certificates, I
9 have an airframe and power plant license, a flight
10 engineer turbo jet license; pilot's license include
11 single engine, multi-engine commercial, multi-engine
12 sea, an ATP for type ratings in the Citation 500, the
13 M298, BAC-111, Fokker-100, Boeing 757, Boeing 767.

14 I also have a flight instructor, instrument
15 instructor rating.

16 MR. SCHLEEDE: I didn't know if I missed it.
17 Did you say you have a type rating on a 737?

18 THE WITNESS: No, I do not. As far as
19 background goes, my work experience, I started off in
20 1969 as a instructor at Oklahoma State. Went on to
21 work for Executive Airlines out of Boston,
22 Massachusetts, flying Twin Otters, Beech-99's, Queen

1 Air's, Aero Commanders.

2 From that point went on to Air New England,
3 flew Twin Otters. And their for Taylor Wine Company,
4 Great Western Champagne, as a captain on a Maryland
5 Flying Citation.

6 And in 1978, January, I was hired by
7 Allegheny Airlines to be a captain on a M298 or Nord.
8 In 1979 I went over to fly first officer on the Bach-
9 111, then DC-9, Boeing 727. I checked out as a captain
10 in 1984 in the Bach-111, became a check airman on the
11 Bach-111 in 1986.

12 In 1989 I became the Manager, Flight Manger
13 of the Fokker-100 and part of that program was to
14 introduce it to the United States.

15 In 1991 I became a manager of special
16 projects, such as CRM, that's Crew Resource Management,
17 AQP, which is the Advanced Qualification Program. 1993
18 I went back as a check airman on the Boeing 767. And
19 then June 15th, 1994 I became Director of Training and
20 Standards.

21 MR. SCHLEEDE: Thank you very much, Captain
22 Johnson. Mr. Leonard will proceed.

1 MR. LEONARD: Thank you, Captain Johnson.

2 Can you hear me okay, sir?

3 THE WITNESS: Yes, I can.

4 MR. LEONARD: Would you please describe the
5 organization of the USAir Flight Crew Training
6 Department?

7 THE WITNESS: Yes. I report to Captain
8 Murphy, which is the Director, Flight Operations,
9 Senior Director. And then the breakdown from me, as
10 Director of Training, Flight Standards, would be six
11 flight managers. Each equipment type has a flight
12 manager. For instance, the Boeing 737 -300 and -400
13 series would be Captain Gibbs.

14 Reporting to him would be a senior instructor
15 or an assistant, and then a check airman. On that
16 particular fleet, they have roughly 54 check airmen.

17 Overall there's 200 check airmen at USAir.
18 Breaking it off into another area, also under the
19 Director of Training, would be the training schedulers,
20 and that consists of 11 full-time schedulers with a
21 supervisor and three clerical help. Also would be the
22 ground school facility. That's roughly 48 ground

1 school instructors, six supervisors and one manager.

2 As far as office staff goes, there's one
3 manager of special projects and four secretarial staff.

4 MR. LEONARD: And since you assumed your
5 duties in June of 1994, how did you -- what changes did
6 you implement, please?

7 THE WITNESS: To limit my answer to the last
8 six months would be a little misleading. I've been
9 involved in a lot of programs for the last five years.
10 Those programs consisting of CRM or Crew Resource
11 Management, line orientation flight training, the
12 advanced qualification program and working very hard on
13 areas of sea test dependency.

14 And so now that I have this position I'm
15 seeing these programs being realized.

16 MR. LEONARD: And the number of 200
17 instructors, did I hear you right? Is that the
18 staffing of your instructor corps?

19 THE WITNESS: Yes. And the check airmen --
20 to give a little background, a check airman at USAir is
21 a line captain who goes through quite a qualifications
22 program to be a check airman. That check airman is

1 qualified to give training in both simulator and
2 airplane and to do evaluations in simulator and
3 airplane in all seats.

4 MR. LEONARD: And how often do your full-time
5 flight instructors fly on the line as line pilots
6 themselves?

7 THE WITNESS: A check airman has a rotation
8 block at least once a year. Most cases twice a year.
9 But because of the qualifications of the check airman,
10 not only do they do work in the simulator but they do
11 conduct what they call IOE or initial operating
12 experience with the new captain or the new first
13 officer.

14 They also give line checks so that with the
15 integration of doing both simulator and airplane, the
16 check airmen at USAir are very current in flying
17 status.

18 MR. LEONARD: Do you have any dual qualified
19 pilots in your check airman experience?

20 THE WITNESS: I did for a short time in the
21 F-28 and the F-100, being a Fokker airplane. But if
22 you're talking about 737-300 versus 757, no.

1 MR. LEONARD: And what about the performance
2 of their duties. Do they have any double back-to-back
3 training sessions or how do you handle that kind of
4 activity?

5 THE WITNESS: Well, the check airmen work a
6 16-day month and they're scheduled and programmed to
7 have one period per day. So a simulator period, for
8 instance, for a check airman would consist of an hour
9 and a half briefing, a four hour simulator period and a
10 one hour debriefing. And that would be the day for the
11 check airman.

12 MR. LEONARD: And how would you characterize
13 the turnover rate or the stability of the instructor
14 corps at USAir?

15 THE WITNESS: Well, the check airmen are a
16 very stable group and I'd like to go into the
17 background of it.

18 To be a check airman at USAir you do have to
19 be a line captain with over 300 hours of pilot in
20 command at USAir. From that point it's quite a
21 selection process, meaning you can either solicit
22 yourself for the position or have someone recommend

1 you, such as a director or chief pilot, flight manager
2 or another check airman.

3 From that point you go into a check airman
4 pool where the senior instructor would actually do a
5 background check on that individual. From that point,
6 run it by the standardization committee of that
7 aircraft type. At that point you'd be invited to go
8 through the check airman training.

9 Check airman training consists of a one-day
10 eight hour course going over FAR's that are associated
11 with the training department, such as Part 121,
12 Appendix E, F and H. He'll also go under learning and
13 technique; go under training and evaluation procedures.
14 Also, deal with LOFT or line orientation flight
15 training or advanced simulation.

16 During that course also the FAA comes in to
17 go over the rules and responsibilities of that check
18 airman. From that point the check airman goes through
19 four hours of simulator training, learning how to
20 operate the simulator, to set up meteorological
21 conditions, to set up geographic conditions and to set
22 up systems and abnormals to those systems.

1 At that point the check airman applicant
2 watches a full training period which is over seven
3 periods as the day I described. At the end of that,
4 the check airman then gets some training in the
5 simulator in the right seat for two hours and then the
6 FAA comes over, evaluates the new check airman's
7 performance from the right seat with hard maneuvers
8 such as a V-1 cut, meaning an engine failure at
9 rotation or a single engine IOS to possibly a go
10 around.

11 After that the FAA representative will get in
12 the left seat and demonstrate some errors to see how
13 the new check airman would react to that. At that
14 point the check airman would go on to watch a
15 proficiency check and then conduct a proficiency check
16 with the FAA observing.

17 After that the check airman applicant would
18 get some time in the airplane on a training mission and
19 then go on line from the right seat, demonstrating to
20 an FAA observer two landings.

21 At that point the applicant would go on to
22 what they call TSD, training skills development course,

1 for three days where they would learn the very basics
2 of training, where they'd use the overhead projector,
3 blackboards. During that process they're video'd and
4 then it's a self-critique, peer critique of their
5 performance.

6 After all that process is accomplished, then
7 I submit a letter to the FAA, the principal operating
8 inspector, requesting that this individual become a
9 check airman.

10 So with a process that long and that hard, we
11 have a very slow turnover.

12 MR. LEONARD: I can see that.

13 And how is their performance monitored during
14 their term as instructors?

15 THE WITNESS: Maybe we're talking about how
16 is the standardization held up for those instructors?

17 MR. LEONARD: Yes. That would be it. Thank
18 you.

19 THE WITNESS: Well, USAir, especially in the
20 training department, it's quite a standardization
21 process. It starts on an every day event with the tech
22 writers and then at my level having a manager's meeting

1 on a bimonthly basis.

2 Then from there, the manager's have a
3 standardization meeting with our APD's or aircraft
4 program designees. From that there's a standardization
5 meeting among all the check airmen on a quarterly
6 basis.

7 And then also the check airmen being line
8 pilots get a proficiency check every six months and a
9 line check annually. But on top of all that, at USAir,
10 whenever a check airman recommends a pilot for his type
11 rating, that check airman sits in the right seat during
12 a ride so that the check airman or the designee or the
13 FAA that's giving the ride actually has another
14 opportunity to evaluate the performance of the check
15 airman. So it's an ongoing process.

16 MR. LEONARD: I'd like to talk for a few
17 moments about specific training issues or areas. For
18 instance, how would you characterize the general
19 subject of aircraft transfer control within a cockpit
20 and training USAir in that specific subject?

21 THE WITNESS: Okay. Transfer control is kind
22 of a new term. We used to use the term positive

1 control and we switched over the transfer control.

2 We've identified it two ways. It's always
3 been in our flight operations manual and from there
4 we've used it in the training environment.

5 Transfer control comes into play during an
6 emergency or an abnormal where with a two-man crew we'd
7 have to ensure that one pilot flies the airplane and
8 monitors the airplane while the second pilot handles
9 the abnormal or the emergency. We'd delineate the
10 task.

11 In a normal operation, that comes into play
12 sometimes when the flying pilot wants to do an approach
13 briefing. He ensures that the non-flying pilot assumes
14 control of the aircraft. He will go through a process
15 of verbalizing it, meaning, "I've got it" or "You've
16 got it," and then the pilot taking the airplane takes
17 the airplane and says, "I've got it," with a
18 confirmation by both pilots. That is in our written
19 document.

20 MR. LEONARD: In the area of training for yaw
21 damper malfunctions in 737-300 aircraft, could you
22 address that and what type of training is accomplished

1 at USAir in that malfunction?

2 THE WITNESS: In the Pilot Handbook, under
3 the section title Abnormal, there is an abnormal
4 associated with a yaw damper failure and that failure
5 is that if the light comes on, the yaw damper is
6 operative and so the pilot action is to reach up and
7 select the switch to the yaw position.

8 I notice there was a revision in December on
9 the Boeing 737-300 and -200 series that addressed
10 uncommand yaw. We've just received that revision from
11 Boeing and we acted in a very timely manner and brought
12 that information and disseminated it to all our pilots
13 through a letter from the Flight Manager. We addressed
14 it in the E-mail, meaning at USAir any time a pilot
15 signs in for a trip, he does it through a tabletop
16 computer. When he signs in for the trip, then this is
17 mandatory reading.

18 We've also put this new procedure on a flight
19 plan release. We've also sent a letter out to every
20 chief pilot to post.

21 So those are the two maneuvers or procedures
22 that come to mind.

1 MR. LEONARD: If I could ask you to refer to
2 Exhibit Number 2-L, if you would, please?

3 Exhibit 2-L is a Boeing 737 Operations Manual
4 change dated December 9, '94. And if you'd look on the
5 right-hand side of that change, the last two items, the
6 first item to which I'm referring is the -- well, let's
7 take the last item first, yaw damper, down at the
8 bottom right on the right-hand side.

9 And that's the one to which you were just
10 referring about the light; correct?

11 THE WITNESS: That would be the light. Yes.

12 MR. LEONARD: To the best of your knowledge,
13 has that been the only yaw damper procedure addressed
14 in 737 operations or procedures?

15 THE WITNESS: Yes.

16 MR. LEONARD: And that's -- to the best of
17 your knowledge, that procedure -- I guess I'd like to
18 emphasize that point. There have been no other
19 procedures that you know of in your experience other
20 than that one until this December 9th change came
21 about. Is that correct?

22 THE WITNESS: That's a correct statement. We

1 take our guidance from the manufacturer to give the
2 revision to the procedures whether they be normal or
3 non-normal.

4 MR. LEONARD: All right. Thank you.

5 And the procedure just about that now which
6 has a line next to it indicate that that's the change
7 and that's the new procedure, you just discussed that,
8 but could you amplify just a little bit, Captain
9 Johnson, for me?

10 THE WITNESS: Yes. That is the new procedure
11 that I was talking about and that will go into our
12 Handbooks, the Pilot Handbook.

13 I should mention that that was introduced as
14 what they call a non-normal procedure and it's not a
15 recall procedure by Boeing. At USAir we would define a
16 time critical or life threatening procedure as an
17 emergency and something that's not time critical or
18 non-life threatening as an abnormal.

19 This procedure normally would go in in the
20 abnormal section but we upgraded it and put it into the
21 emergency section as a recall or a memory item.

22 MR. LEONARD: You raised a good point. Just

1 for clarification purposes, essentially there are two
2 procedures that a pilot has to have in his knowledge
3 bank, if you will. One of them is the emergency
4 procedures -- and they're called different things by
5 different airlines and these are immediate recall
6 items.

7 How do you define those at USAir?

8 THE WITNESS: We broke down the non-normal
9 section to emergency and abnormals versus non-normal,
10 recall or non-recall.

11 MR. LEONARD: And so the procedures that are
12 -- to which you can refer to a checklist are called
13 what then?

14 THE WITNESS: Well, we have two checklists
15 available, plus the pilot handbook with an explanation
16 of all the emergencies and abnormal procedures. But one
17 card would be classified emergency and they would have
18 recall or memory items on it. Yes.

19 MR. LEONARD: Thank you.

20 Would you look at Exhibit 2-J, please, page
21 7? And this is an excerpt from the USAir pilot's
22 handbook training section.

1 Would you discuss with us for a few moments
2 the nature of that item?

3 THE WITNESS: Yes. The entitlement is Dutch
4 roll, and Dutch roll is one of the maneuvers that we
5 train all USAir pilots on in all aircraft types that
6 they go into. The Dutch roll is a maneuver that's a
7 recognized maneuver. It was described by one of our
8 witnesses earlier and what corrective action needs to
9 be taken to recover from that Dutch roll maneuver.

10 In a 737 with more of a swept wing, that was
11 more of a critical maneuver. But something like a 737
12 has very few oscillations and because of the stability
13 of the airplane, it does stabilize itself, but we still
14 go through that type of training, meaning to recognize
15 that phenomena.

16 MR. LEONARD: And you do that by the
17 procedure that's indicated at the bottom of that page?

18 THE WITNESS: Yes, sir.

19 MR. LEONARD: Would you refer, please, to
20 Exhibit 2-D, the flight information letter. And the
21 subject is the rudder PCU operation anomalies.

22 Would you please discuss with us from what

1 document this -- it says in here, of course, it's from
2 a 737 pilot's handbook, but could you describe the
3 background of the nature of these letters?

4 THE WITNESS: I believe we're referring to
5 the flight information letter. A little background on
6 a flight information letter.

7 That letter is from the flight manager. This
8 does go in as part of the pilot handbook and it is
9 recorded.

10 There's two reasons for a flight information
11 letter. One is, as this letter, is to give some
12 information to the line pilots on subjects that's
13 controversy. A second reason for the flight
14 information letter is to get information out in a
15 timely manner.

16 Flight information letters usually have a
17 life, a shelf life of a year. And the second example I
18 gave, when it's information that's timely, we can get
19 it out on this letter and then address that item.

20 Now, sometimes that item might be reflected
21 in four or five chapters. In this particular rudder
22 PCU operation anomalies, this was from Captain Sturpe

1 who is the flight manager. And he put this letter out
2 so that he could break some of the gossip that was
3 going out concerning this issue, to reconfirm that the
4 checklist and the operations list that we were working
5 with that was approved by Boeing was a good one.

6 MR. LEONARD: And that procedure basically
7 carries on to the second page, in which it talks about
8 no special operational procedures are being requested,
9 but it does talk about the flight control check and the
10 before takeoff check which had been alluded to in
11 earlier testimony as far as pilots checking for any PCU
12 anomalies?

13 THE WITNESS: Yes, sir.

14 MR. LEONARD: And could you think of any
15 other type of letters that might be used or information
16 that might be provided to pilots on these type of
17 letters?

18 THE WITNESS: There is an operations bulletin
19 they call they Blue Letter. That also comes out from
20 the Director of Operations and that comes out in a very
21 timely fashion.

22 CHAIRMAN HALL: Excuse me. Captain, what was

1 the gossip?

2 THE WITNESS: After some of the incidents
3 with United, that there was a possibility with the PCU
4 valve and there was some concern on that. And that
5 maybe there should be a procedure or stop pilots from
6 making up procedures to address any kind of anomalies
7 connected to the rudder.

8 CHAIRMAN HALL: Thank you.

9 MR. LEONARD: Would you refer to Exhibit 2-R,
10 please, which is a Boeing flight operations review
11 dated 13 July '93.

12 Are you familiar with this publication,
13 Captain Johnson?

14 THE WITNESS: Yes, I am.

15 MR. LEONARD: And when you receive something
16 along these lines, how do you implement it or how does
17 your department use it?

18 THE WITNESS: Okay. This was a -- really
19 we're mandated to a revision or something from the
20 Boeing's Ops Bulletin. This information in the flight
21 operations review, we've already addressed. Just
22 looking at the opening paragraphs, that's addressed in

1 the pilot handbook on two areas or two sections that I
2 know, and that's the forward of the Emergency Section,
3 1-1-1, and the forward of the Abnormal Section 1-300-3.

4 Looking through it in some other areas, on
5 the bottom of the page, Items number 1 and 2 are also
6 addressed in the Abnormal Section. In fact, it's
7 addressed in the jammed or partial flight control
8 section, 1-307-6, I think.

9 So a lot of it has been taken care of. But
10 also, I'd like to point out on the last page, asking
11 that question, the last sentence says, "This
12 information will be incorporated in appropriate detail
13 in future revisions of the model flight crew training
14 manual." But when it comes out in that manual, that
15 puts a little more credence or importance to this, but
16 we have addressed this letter.

17 MR. LEONARD: I understand. All right.
18 Thank you.

19 What type of training does USAir provide
20 their flight crews in the use of the standby rudder?
21 Would you be able to address that for us?

22 THE WITNESS: The standby rudder in the

1 Boeing 737-300 is not a stand alone procedure. It's
2 actually integrated into some of the abnormalities
3 associated with the hydraulic failures. I believe it
4 was brought up that the rudder works both off the A
5 system and the B system hydraulic system. If one of the
6 systems was lost, part of that procedure is to turn on
7 the standby pump.

8 Also, if you lost both hydraulic systems, you
9 could capture the rudder with the use of this system.

10 MR. LEONARD: And that's pretty much the
11 extent of the training that USAir --

12 THE WITNESS: That's the extent. As I say,
13 it's not a stand alone procedure.

14 MR. LEONARD: Right. And would this normally
15 be addressed in initial training or could it take place
16 in say a line oriented flight training maneuver, or how
17 would that happen?

18 THE WITNESS: Yes. Our pilots definitely
19 would be taught this procedure during the initial
20 training, but then they would be subject to that,
21 whether it be a recurrent LOFT or a pilot check or a
22 pilot training period.

1 MR. LEONARD: I understand. Thank you.

2 Let's talk for a few moments, Captain
3 Johnson, about your monitoring of training trends and I
4 guess you could call it trends and analysis in such
5 areas as problems that might develop in crew training,
6 proficiency checks, failure rates and those kind of
7 things, and how your office handles that type of
8 activity.

9 THE WITNESS: Well, we are working towards
10 the advanced qualification program, and part of that
11 would be the trend analysis. Last April we put into
12 place a trend analysis program and that consists of a
13 tabletop computer in the instructor's area. After a
14 pilot training period or proficiency training period or
15 proficiency check or recurrent LOFT, the instruct then
16 goes to the computer.

17 The computer has four categories. The first
18 one is to identify the aircraft type. The second is
19 the seat position. Then the third would go through the
20 menu of maneuvers and then the fourth would be the
21 reason code. So in other words, maybe the first item
22 is a noise abatement takeoff. So after punching that

1 in, the reason code would bring up five categories.
2 One is that the maneuver was done to standard. The
3 second is the maneuver was done to standard after being
4 debriefed. The third one, standard with additional
5 training and then to standard; and then fourth, that it
6 was not accomplished and it would have to be addressed
7 at another time.

8 So with that information going into the
9 computer each month I get a readout on aircraft type of
10 fleet type on the different maneuvers.

11 I should also bring out that when a maneuver
12 is not standard another window breaks open to address
13 why it wasn't standard, meaning was it a breakdown in
14 CRM, was it a breakdown in skills or was it a breakdown
15 in execution. And that program is ongoing right now.

16 MR. LEONARD: Now, is that broken -- that's
17 of course broken down by category of aircraft, too, and
18 there's probably more activity within the particular
19 aircraft category specific to that airplane.

20 How does that work at the basic level after
21 the instructor has put this in? I know it goes to your
22 level eventually, but how about the air crew program

1 managers and the senior instructors. How do they
2 function in this area?

3 THE WITNESS: Yes. I address that at my
4 meeting with the flight managers on the progress of
5 where we are. Then from that point the flight managers
6 break off with air standards meetings to see what they
7 need to address and what items have changed.

8 It's always an ongoing process. It's dynamic
9 in nature. Things do change.

10 MR. LEONARD: And other than your full-time
11 instructors, who else are included in those kind of
12 activities relative to this monitoring trends?

13 THE WITNESS: The only one right now besides
14 the group I mentioned would be the principal operations
15 inspector of USAir. We do share it with him and that's
16 it.

17 MR. LEONARD: I see. And how about like
18 proficiency checks? How do you monitor that type of
19 activity just in general terms? The failures and that
20 type of thing.

21 THE WITNESS: We comply with inspector's
22 handbook. In fact, it would be Operational Handbook

1 8400-10 and it would be Section 545, that would be
2 conduct of a proficiency and competency check. I think
3 it would be subpart B, proficiency training.

4 And under that, we have a form OF-38 and that
5 would be a -- 32, rather, which would be a training
6 form. The boxes would be filled in, meaning name,
7 license number, medical, so on. And then for instance
8 in a pilot check, there are three boxes. Either it was
9 satisfactory, was substandard, it was incomplete.

10 Then there's another box on the end of it
11 that has comment, so that if a proficiency check was
12 not standard in all the maneuvers -- say one maneuver
13 was substandard and there was time available, they
14 could give training after the proficiency check and
15 then reevaluate. And if he was successful on the
16 reevaluation of that maneuver, it then would go down as
17 a satisfactory ride.

18 MR. LEONARD: And this is permitted by the
19 Inspector's Handbook; correct?

20 THE WITNESS: Yes. That's, as I said, 8400-
21 10, which is the FAA's inspector's bible.

22 MR. LEONARD: And how do you keep records of

1 those kind of activities, events, where retraining is
2 done in a specific maneuver?

3 THE WITNESS: Okay. MIS or management
4 information services, always has that information
5 available. So there's really -- I do have, not under
6 our department but independent, would be a records
7 department for that information.

8 MR. LEONARD: And that information is
9 provided to the principal operations inspector?

10 THE WITNESS: Yes, it is. It's available to
11 the POI.

12 MR. LEONARD: Would you describe your
13 relationship -- how would you describe your
14 relationship in the training department with the local
15 principal operations inspector?

16 THE WITNESS: Flight Standards District
17 Office in Pittsburgh, I would say we had a very
18 technical professional relationship. I think this
19 office really prescribes to Demming's Total Quality
20 Management. They've been involved in some very good
21 programs, one they've sponsored with ALPA/USAir; the
22 Altitude Awareness Program which was very successful.

1 Our FSDO office has been very much involved
2 with 8400-10 to help us with our flight operations
3 training manual to put it in compliance with that. And
4 I think we were the first airline to do so.

5 This office is very interested in the
6 development of FOQAP, which would be Flight Operations
7 Quality Assurance Program. They've been interested in
8 the aging fleet and so they've really been way ahead on
9 programs, being very supportive.

10 As far as my dealings to, I have to keep in
11 mind as a Training Department they are responsible for
12 the oversight of all training and flight operations.
13 That they are responsible for the approvals of all my
14 programs. They do surveillance on those programs and
15 they do inspections of those programs.

16 But I have to say that in the relationship
17 they've been very fair. They're very even-handed. And
18 I do know that they're there to make sure that we
19 comply with all the FAR's and comply with trying to get
20 to the greatest level of safety compliance.

21 MR. LEONARD: If you have a procedure in a
22 particular aircraft, be it a checklist or changing the

1 syllabus in the training, how do you coordinate that
2 with your local FAA office?

3 THE WITNESS: Well, under the POI, he has
4 what's called an APM or Aircraft Program Manager for
5 each aircraft. So, for instance, if the 737-300 wanted
6 to make a change, the flight manager of that program
7 would interact with the program manager and then after
8 they were squared away they would go before the POI to
9 have that checklist signed. So he's the final
10 authority.

11 MR. LEONARD: And what's been your experience
12 in terms of -- is this a cooperative effort? Is this
13 an effort that results in simple changes? If you want
14 to change something, does it take long or is the
15 process very quick?

16 THE WITNESS: Well, of course, I want to
17 change things now and that's not always the case. But
18 this office has always been available and they address
19 everything in a very timely manner. But I have to say
20 that delay sometimes comes in the fact that they do the
21 research. It's not just a blind sign. That they
22 actually do their homework, so --

1 MR. LEONARD: To change direction a little
2 bit, I'd like to talk somewhat about advisory
3 circulars. There are a number of them I'd like to get
4 your thoughts on, but would you give me a little
5 overview of what your perception of what an FAA
6 advisory circular involves as far as you're concerned?

7 THE WITNESS: Well, for us an advisory
8 circular is a document issued by the FAA for the
9 aviation community. In my case, they usually address a
10 training issue. They give direction for the
11 development and the implementation of such a program.
12 An example would be for windshear, RTO, CRM programs,
13 AQP.

14 In fact, a lot of the direction for those
15 advisory circulars I believe comes from the NTSB on
16 suggestions or recommendations. I think that we like
17 those advisory circulars very much. We've used them as
18 patterns for quite a few programs.

19 MR. LEONARD: Would you refer to Exhibit 2-P,
20 papa, please? And that's Advisory Circular 120-51A,
21 Crew Resource Management Training.

22 Could you please comment on your knowledge of

1 that program? I know that you had some early
2 activities in it and how USAir has implemented this
3 advisory circular.

4 THE WITNESS: Well, that was one of the areas
5 that one of the accidents or maybe quite a few of the
6 accidents over the years that the NTSB recommended such
7 a program. This advisory circular did come out. There
8 were some changes that came out earlier than '93.

9 At USAir we took this advisory circular and
10 we used it as the pattern, meaning we followed this
11 advisory circular, I believe, to the letter. We do our
12 CRM program, our Crew Resource Management, as outlined.
13 Meaning, we have an indoctrination awareness phase
14 which consists of an academic course. At that time we
15 go over what we call behavioral markers,
16 communications, decisionmaking, situational awareness,
17 workload management, leadership/followership roles, and
18 technical proficiency.

19 From that point, we address it in the
20 simulators where we've gone to a recurrent LOFT
21 training program where we've introduced video cameras
22 into the simulators. At the LOFT, line orientation

1 flight training, the check airman wears a hat; that of
2 an instruction, that of a check airman or evaluator and
3 that of a facilitator. And so at that time we try to
4 get the applicants or the pilots to talk about their
5 performance and it gives them an opportunity to see
6 themselves from a third person perspective.

7 And I believe this step is called the
8 recurrency practice feedback.

9 And the third is called the reinforcement
10 stage, and that's in the ground schools. We have a
11 one-hour module where we address CRM issues, usually
12 affiliated with a LOFT.

13 Now, at USAir, we redesigned the recurrent
14 LOFT and the module of reinforcement for the ground
15 school on an annual basis so no USAir pilot goes
16 through that LOFT twice.

17 I should say that we did develop this program
18 in house, but as a reference and of great assistance we
19 used the University of Texas through NASA, and that was
20 Dr. Helmrich for guidance.

21 MR. LEONARD: And how have you implemented
22 this program in regards to other flight crew

1 activities, flight attendants or IAM or that type of
2 activity?

3 THE WITNESS: When this program originally
4 start off, CRM is cockpit resource management and then
5 it expanded to crew resource management. At USAir, I
6 should bring up that during the module of training in
7 the ground school, that's taught or facilitated by both
8 a pilot and a flight attendant that's co-developed that
9 program so that the flight attendants see the exact
10 module during their recurrency event.

11 When we had the awareness or the first phase,
12 the indoctrination, we had many people in that course
13 participating that were not pilots. Maintenance sent
14 people representatives, the dispatchers sent people,
15 flight attendants, to look at that program and see if
16 they wanted to develop it more.

17 We also had people from the outside. We had
18 military people come in. In fact, we taught this
19 course at installations all over the country. We also
20 had people from the Atomic Energy Plant here in
21 Pittsburgh go through the program. We also had people
22 from Amtrak and other airlines as far as Australia.

1 But to limit on the scope of the question,
2 we've integrated this program to the flight attendants.
3 And as Mickey Cohen talked about yesterday, it's gone
4 farther through maintenance.

5 Also, our FSDO office under our POI had all
6 his inspectors and aircraft program managers go through
7 the program. We've also had FAA inspectors from
8 throughout the country participate.

9 MR. LEONARD: Thank you.

10 Would you refer to Exhibit 2-Q, please?
11 That's an Advisory Circular 120-54, Advanced
12 Qualification Program. You've alluded to this just a
13 few minutes ago, Captain Johnson, but would you please
14 -- maybe you can give just a brief overview as to what
15 the Advanced Qualification Program is and then you
16 could tell us how USAir is in the process of
17 implementing that advisory circular.

18 THE WITNESS: The Advanced Qualification
19 Program is quite extensive but just to give a quick
20 overview, most of the FAR's have not been rewritten
21 since the early '70s. Since that time, the airplanes
22 have become more complex; that is, being computerized.

1 Also, the training devices have become more
2 computerized; that is, computer-based trainings and so
3 on. So about five years ago the FAA and the government
4 realized that there had to be some changes in training,
5 that they had to upgrade. So the government and
6 industry go together and they decided on this program,
7 the Advanced Qualification Program.

8 The Advanced Qualification Program is really
9 tailor-made for each company where they do an up front
10 analysis, meaning they take every task they do and they
11 break it down to a task, sub-task, element, sub-
12 element. They put in the skills, the knowledge, the
13 attitudes that are a part of that task and then they
14 put it into a computer device. In our case it would be
15 ISD or Instructional System Design. And with it they
16 put a spin onto that program of the criticality of that
17 maneuver or that task, degree of difficulty and how
18 often it occurs. And that is, I should say, there is a
19 human element to that. There's something called the
20 SME, or Subject Matter Expert that gives the input to
21 this.

22 The computer then will point out the training

1 of what type of training should be done, what the media
2 for that training, what level of instructor should be
3 for that training and how many times that event should
4 be trained.

5 From that point, courseware is developed and
6 a trend analysis is kept. And the trend analysis is
7 there to support what the up front analysis did for
8 you. So, in other words, if a V-1 cut, an engine
9 failure, was repeated over and over again, it's time to
10 go back to the drawing board and see what you're doing
11 wrong.

12 USAir is involved with that program. It's
13 five steps. And we're well along on the second step,
14 meaning we're doing the task analysis right now.

15 MR. LEONARD: Which aircraft will be the lead
16 aircraft in the AQP program for USAir?

17 THE WITNESS: The lead airplane is the 737-
18 300.

19 MR. LEONARD: I see.

20 THE WITNESS: I should say that the program
21 that I was talking about, we did acquire from Boeing
22 Corporation. They were kind enough to help us with

1 this program.

2 MR. LEONARD: And that program, before it's
3 implemented fully, it has to be approved by the POI.
4 Is that correct?

5 THE WITNESS: Yes. I just gave a really
6 oversimplification. That data does go to Washington
7 and it is approved by our local FSDO. I mean, there's
8 a lot of checks and balances throughout that program,
9 yes.

10 MR. LEONARD: Would you anticipate that all
11 aircraft in your fleet would be under the AQP program
12 eventually?

13 THE WITNESS: Yes.

14 MR. LEONARD: Thank you.

15 I'd like to talk a few minute about the 737-
16 300 auto flight system, if we could. The 737-300 has a
17 somewhat advanced auto flight system. I wonder if you'd
18 briefly describe some of the major components in this
19 system.

20 THE WITNESS: The 737 is an advanced
21 airplane. It starts off maybe with what's called a
22 flight management computer and that flight management

1 computer allows pilots to program their trip, meaning
2 laterally point-to-point, say Pittsburgh to Daytona
3 Beach, Florida, and then to do it vertically, meaning
4 the optimum on altitudes, optimums on airspeeds.

5 Also with that computer you can do
6 computations of time and fuel burns.

7 Connected to that computer to give it an idea
8 where it is for all this is computers called the IRS,
9 Inertia Reference Systems. And without me really
10 knowing too much about this 44 pound green box, it's
11 done with lasers, gyros, accelerometers and so on.

12 With that, the IRS after being aligned, it
13 knows where it's at at all times. It feeds this data
14 to the computer so the computer can keep up where it
15 is. Also on the 737-300 they do have a flight director
16 system and they have an auto throttle system. So it's
17 a very automated airplane.

18 MR. LEONARD: And how reliable is this
19 system?

20 THE WITNESS: It's extremely reliable. I was
21 given an example today, and that is I believe there's
22 never been an accident on an auto land with this

1 airplane.

2 As far as reliability goes, everybody likes
3 to use these associations with the car industry. And
4 I'll say it's as good as your new car or your new Sony
5 television.

6 MR. LEONARD: And what type of flight
7 training are the crews provided in the use of this auto
8 flight system?

9 THE WITNESS: Well, we prescribe to a
10 seamless type of flight training where at day one the
11 pilot going through the equipment school has half a day
12 of academic and then half a day in a training device.
13 These training devices are very sophisticated. They're
14 actually simulators that are not on jacks or what we
15 call not flyable. And they do not have a visual system
16 connected. But everything else does work. They
17 actually have ground flight logic.

18 So that we start this integration and we
19 start with all the automation and then we degraded out
20 of the automation, meaning we try to get the pilots to
21 feel familiar with the automation.

22 This starts from day one and its seamless all

1 the way through the simulator and the aircraft
2 training.

3 MR. LEONARD: Would it be fair to
4 characterize the training in the 737-300 as the use of
5 the auto flight system is fairly extensive in the
6 training right through and through the line operation
7 for the normal pilot operations?

8 THE WITNESS: I think I'd use the word
9 extensive. Yes.

10 MR. LEONARD: In normal operations, the crew
11 would be expected shortly after takeoff they would
12 engage the autopilot and they might also have the auto-
13 throttles engaged at that time or even during the
14 takeoff?

15 THE WITNESS: Well, I used the term earlier,
16 talking about crew resource management, and Dr. Lauber
17 had the best description. And I believe that was the
18 use of all your resources, hardware, humanware,
19 software, for effective, safe and efficient flight.

20 So the autopilot in this case is the
21 hardware, so the expectation would be to use it. It's
22 part of your managerial skills now as a pilot that

1 we're trying to get away from coordinated maneuvers
2 such as hand-eye skills all the time and be able to do
3 an oversight of the cockpit. And that oversight
4 includes the use of these computers.

5 MR. LEONARD: So to a certain degree the
6 pilots, the flight crew, become managers of an auto
7 flight system. They program what they want into the
8 system and then monitor that the auto flight system
9 performs those functions.

10 THE WITNESS: Yes. And in fact, the earlier
11 question you were addressing me with about transfer
12 controls, that's an important item now in this very
13 sophisticated world of the auto systems. It's always
14 to ensure that someone is monitoring hands-on to this
15 autopilot. Yes.

16 MR. LEONARD: Now you're also instructor
17 qualified on the 767-757. They also have these
18 advanced systems. Is that correct?

19 THE WITNESS: Yes. Basically the same
20 systems.

21 MR. LEONARD: And what type of training are
22 USAir flight crews provided in malfunctions on those

1 auto flight systems?

2 THE WITNESS: Okay. That's ongoing.

3 Everything from the loss of a flight management
4 computer, the loss of IRS', partial loss of the auto
5 throttles, partial loss of the flight director systems,
6 and so on. So they're constantly being reinforced with
7 these failures so that they have a good overview of the
8 systems. Not to feel too confident or too comfortable
9 or too dependent with such systems.

10 MR. LEONARD: But the failures -- correct me
11 if I'm wrong on this, but would the failures be more in
12 the line of misinformation that it was providing in
13 terms of say such things as navigation and that type of
14 malfunction so you don't get over dependent upon the
15 aircraft following a certain flight path that's been
16 programmed?

17 THE WITNESS: Yes. I think over the years
18 that's been quite a problem looking and reviewing
19 accidents mostly from Third World countries that there
20 was a degradation of the level of automation that was
21 being conducted, meaning the aircraft went from maybe
22 capturing on a localizer glide slope to being on

1 heading and vertical speed. And so part of this
2 process is really looking at the enunciation and
3 understanding what you're reading, understanding
4 exactly what the guidance system is doing for you.

5 MR. LEONARD: What did the -- could you give
6 me your opinion on a question as to whether pilot
7 skills are being lost because of dependence on advanced
8 auto systems?

9 THE WITNESS: You know, I think about the
10 fellows that flew over the Alleghenies in those open
11 cockpits and no instrumentation looking down at light.
12 And we certainly don't do that any more. But yet were
13 they better pilots than we are?

14 I think not. I think you have to address the
15 technology that you're working in today's level and I
16 think pilots today are excellent with the systems that
17 they're working with. I mean, look at the advanced
18 training that they get today versus yesterday.

19 MR. LEONARD: And would it be also fair to
20 characterize the performance of these auto flight
21 systems as being maybe generally smoother than most
22 pilots can hand fly aircraft? Would that be fair to

1 say that?

2 THE WITNESS: Yes. That would be one of the
3 big advantages. The engineers really made it that the
4 G loads are very low, that a much smoother ride can be
5 achieved by the computers or the auto flight systems
6 than the average pilot.

7 MR. LEONARD: And also, economics gets into
8 it, too, doesn't it, Captain Johnson, in terms of
9 parameters of flying, the most economical flight
10 pattern for a particular flight?

11 THE WITNESS: Yes. Especially when go into
12 the flight management computer and to the programming.
13 Yes.

14 MR. LEONARD: Tomorrow a director of training
15 from another carrier is going to provide a briefing,
16 give us a briefing, on what's called an Advanced
17 Maneuver Package and you were normally scheduled to
18 come after that gentleman, but we've accelerated your
19 presence here.

20 I know you're familiar with that program and
21 could you tell, without details of the program itself,
22 what your reaction has been to that type of training in

1 general and what initiatives you might have taken?

2 THE WITNESS: Yes. I had the opportunity to
3 visit the United program that we're speaking about and
4 there were different maneuvers. Some of them unusual
5 attitudes and then engine failures at different
6 altitudes and slow flights and stalls and so on.

7 I thought a lot of those individual maneuvers
8 were in our present training program, but I did think
9 the program was very informational, so much so that
10 when I came back I petitioned the ATA, Airline
11 Transport Association, to look into this. And right
12 now I've been elected to be the chairman of the program
13 to look at Advanced Training Maneuvers.

14 There are different names of it. Right now
15 they may elect to get away from Advanced Training
16 Maneuvers and call it special task maneuvers, but it is
17 in reference to such maneuvers as the steep banks and
18 so on that maybe they're not unusual attitudes. Maybe
19 it's almost acrobatic flight.

20 Anyway, I thought it important enough to
21 address the ATA and they really got behind it and we're
22 going forward. In fact, we're to meet February 16th-

1 17th out in Denver so other members can see the United
2 Program and that we can really formulate exactly what's
3 going to be done in this area.

4 USAir, we don't work in an esoteric area. We
5 really work with industry, as I said, through advisory
6 circulars and so on. So we would really like to make
7 this a national plan; that is, taking all the airline
8 Part 121 flight carriers, taking in NASA, the FAA, who
9 has already come on board, the manufacturers and then
10 vendors such as the simulator personnel.

11 Some of the concerns were by doing it in
12 house what were we developing, and not only what the
13 development process was like, what was the product
14 going to be like. And there is some concern about the
15 simulators. Our simulator and I think any simulator in
16 the country that deals with T category airplanes does
17 not have the aero packages to address some of these
18 maneuvers.

19 And so it's going to be quite a cooperative
20 effort but we're very enthusiastic about this
21 additional training.

22 MR. LEONARD: Thank you. That sounds like an

1 excellent way to approach it.

2 Captain Johnson, you've heard or read the
3 cockpit recorder transcript on Flight 427 and I'm sure
4 you've familiarized yourself with some of the major
5 issues relating to that accident.

6 Could you share with us your views as to what
7 happened in the events just after the upset? Would you
8 be willing to do that?

9 THE WITNESS: That would ask me to speculate
10 I believe. I think Chairman Hall didn't want that in
11 his remarks to his paper, so --

12 MR. LEONARD: Let me ask you this. How would
13 you -- based upon what you've heard so far,
14 characterize the performance or what would you have
15 done in that situation as a flight crew member? What -
16 -

17 THE WITNESS: I think --

18 MR. LEONARD: Go ahead.

19 THE WITNESS: Sorry. Looking at it, it
20 looked like they did follow -- throughout that flight
21 plan, that they followed company procedures, company
22 policies all the way through. So I would think that

1 they followed it right to the end.

2 Looking it with the disengagement of the
3 autopilot and the timely manner that they did
4 accomplish that, I think that I would have reacted --
5 and I'm speculating, but I think I would have reacted
6 in the very same way that this crew did. And as I
7 said, the fact that they did follow all the policies
8 and procedures for that leg, there's no reason not to
9 think otherwise.

10 MR. LEONARD: Do you have anything else you'd
11 like to share with us, Captain Johnson, in any area?

12 THE WITNESS: No, Mr. Leonard.

13 MR. LEONARD: Well, that concludes my
14 questions. Thank you very much, sir.

15 CHAIRMAN HALL: Do any of the parties have
16 questions for this witness?

17 I see USAir's hand. Anyone else?

18 (No response.)

19 If not, Captain Sharp?

20 CAPTAIN SHARP: Captain Johnson, we were --
21 all the parties to the hearing were given today Exhibit
22 2-S which deals with some fueling incidents at USAir.

1 Do you have a copy of the exhibit there?

2 THE WITNESS: I think I'll get one.

3 (Pause.)

4 Yes, I do.

5 CAPTAIN SHARP: Okay. Are you familiar with
6 those incidents?

7 THE WITNESS: Yes, I am.

8 CAPTAIN SHARP: Could you please describe
9 that for us?

10 THE WITNESS: Okay. Without having it in
11 front of me, I believe there were eight incidents where
12 the aircraft departed the gate with the improper fuel
13 amount. Four of those aircraft came back to the gate.
14 I believe one airplane did in route have to land at an
15 alternate airport. Another aircraft came back and
16 landed at the departure airport, and I think two went
17 on to the destination.

18 A little background to all of that is that
19 under a 121 carrier, as USAir is, there's an agreement
20 on a fuel load, and that agreement or that partnership
21 comes between the captain or the pilot in command and
22 what's called the dispatcher. So that sometimes the

1 fuel loads, they change to the loads that the airplane
2 is carrying to the price of fuel at the other locations
3 that they're going on their destinations.

4 In these cases, they were in breach of the
5 checklist. They were violated. At least discipline
6 action was taken by USAir in all case. But USAir, the
7 company that it is, had a moral obligation to go a
8 little farther than just discipline action on a few
9 individuals so we actually looked into those items to
10 see if we could make a procedural change.

11 Out of this, two procedural changes were
12 made, and one is that the pilots would enter the fuel
13 load into the ACRA's, and that's a computer maybe I
14 forgot to mention and I believe stands for Air Line
15 Communications Reporting and Addressing System, and
16 it's sort of a datalink uplink where the pilot can type
17 messages on this computer and send it to the
18 dispatcher. Also, it keeps other parameters in the
19 aircraft.

20 Anyway, the pilots now have to enter the fuel
21 load and confirm it for the pilot that didn't type it.

22 And then the second change came in having the

1 gate agent give the number of people on board and the
2 fuel load. Since those changes were implemented we
3 have not had another incident of a plane pushing off
4 the gate with a wrong fuel amount.

5 CAPTAIN SHARP: To your knowledge, is there
6 any evidence at all that Flight 427 might have departed
7 Chicago with an improper fuel load?

8 THE WITNESS: No. They had the proper fuel
9 load.

10 CAPTAIN SHARP: Let me turn your attention to
11 the PCU. Prior to USAir putting out it's flight
12 information letter which was Exhibit 2-D, was USAir
13 aware of any event or circumstances from any source
14 regarding PCU anomalies?

15 THE WITNESS: You mean industry examples?

16 CAPTAIN SHARP: Right. Yes.

17 THE WITNESS: We were, yes. Not exactly
18 pinpointing it. USAir is an operator. We don't do the
19 technical follow up to this.

20 CAPTAIN SHARP: With regard specifically to
21 the Colorado Springs and the Chicago incident with
22 United?

1 THE WITNESS: We were aware that there was
2 something but not the causal effect of what happened.

3 CAPTAIN SHARP: Has it always been USAir's
4 procedure in training for the flight crews of any
5 flight on the before takeoff checklist to do a full
6 flight control check?

7 THE WITNESS: That has been always a policy
8 and a procedure for all USAir aircraft and the 737-300.
9 We've always done that.

10 CAPTAIN SHARP: And has this procedure always
11 required that the pilots do a full deflection of the
12 rudder?

13 THE WITNESS: Yes. A full deflection of the
14 rudder and ailerons and yoke.

15 CAPTAIN SHARP: You were discussing just a
16 moment ago with Mr. Leonard the unusual attitude
17 training. Has USAir ever been advised by any
18 manufacturer or the FAA that they recommended acrobatic
19 training for USAir's pilots?

20 THE WITNESS: No. We've never gotten
21 guidance from any of the manufacturers whether it be
22 Boeing, Fokker or Douglas. And the FAA has not come

1 out with a statement addressing this type of training.

2 So it's kind of stand alone.

3 CAPTAIN SHARP: Okay. Let's turn for the
4 next question to wake turbulence. For the moment,
5 assume a USAir 737-300 encountering wingtip vortex
6 following a 727. The strength of the vortex, 1500 foot
7 square per second and at 6,000 feet and a speed of 190
8 knots with the autopilot engaged. You have induced a
9 rolling moment bank that goes up to 20 or 30 degrees
10 for about two or three seconds.

11 Now, how would you have expected the pilots
12 to react with the background and training and Captain
13 Gerano and First Officer Emmitt had?

14 THE WITNESS: I think they would have tried
15 to right the airplane up with aileron immediately,
16 whether initially just taking the yoke and degrading it
17 to control wheel steering, and then right behind that
18 probably selecting the autopilot to the off position.

19 CAPTAIN SHARP: Would you have expected the
20 use of any rudder or significant rudder inputs?

21 THE WITNESS: No. I think this is an overuse
22 on this rudder. Rudder at the higher speeds is really

1 ineffective for the pilot. Really, if we think of what
2 a rudder is, it's to coordinate turns. And then with
3 the higher airloads, there's very little rudder to be
4 used.

5 So in all our training, and if you look at
6 the early documents that we went over, the Dutch roll,
7 those elements of training are to be addressed in
8 something of this nature, meaning some of the elements
9 that we address when we train for stalls would be
10 addressed today on 427. Meaning, once a year at USAir
11 you are evaluated on a stall series that's on a bank.

12 We also do steep turns, and the element of
13 those steep turns is a 45 degree turn. Those elements
14 would also be incorporated in a recovery of something
15 like this.

16 So maybe we have not duplicated something in
17 training of what 427 went through this day, but the
18 training, the elements of that event were accomplished.

19 CAPTAIN SHARP: Okay. I have just one other
20 question. Maybe a little correction to a comment made
21 earlier today.

22 There was a suggestion that the reason the

1 application of ailerons did not or would not counteract
2 any rudder deflection of the aircraft experiencing at
3 that time, an inference was made to that today. And
4 that Captain Gerano and First Office Emmitt didn't apply
5 aileron in a timely fashion.

6 Would you care to comment about that?

7 THE WITNESS: I think that's incredulous that
8 that would be brought up. That any airline pilot with
9 that type of time, that type of experience, in this
10 case the captain being military trained, to boot, would
11 react immediately to an event like that. I think maybe
12 that question maybe was wrong or -- that's -- they
13 would have reacted immediately.

14 CAPTAIN SHARP: Thank you, Captain Johnson.
15 Mr. Chairman, that's all I have.

16 CHAIRMAN HALL: Thank you, Captain.
17 Other questions?

18 Mr. Marx?

19 MR. MARX: I have no questions.

20 CHAIRMAN HALL: Mr. Clark?

21 MR. CLARK: In the instructions you provide
22 for the rudder checks on the ground, do you provide

1 instruction just to stroke the peddles fully or make
2 sure they're bottomed out on the stops, hold them for a
3 count? What are the exact instructions provided to the
4 crews?

5 THE WITNESS: Yes. You have it right. To
6 push the rudder peddle to the stops, and both rudder
7 peddles.

8 MR. CLARK: Make sure they're bottomed on the
9 stops?

10 THE WITNESS: Yes.

11 MR. CLARK: Is there any attempt to hold it
12 for a count or anything like that, or just to bottom
13 them?

14 THE WITNESS: No. But dealing with a rudder
15 as big as the one on the 737, you wouldn't slam dunk
16 it. You would push it down with authority to the stop,
17 and so it would be done in a smooth motion.

18 MR. CLARK: Okay. Thank you.

19 CHAIRMAN HALL: Mr. Schleede?

20 MR. SCHLEEDE: Yes. Just a couple area.

21 Captain Johnson, are there any maneuvers that
22 are trained for use of the rudder during flight other

1 than engine out?

2 THE WITNESS: Yes. That would be the jammed
3 flight controls. There is some training in that, or
4 partial flight controls. But really, you've hit on a
5 big area. Engine failure for adverse yaw would really
6 be quite a demonstration, especially at the rotation
7 point of a takeoff having an engine failure. The
8 gyroscopic procession would create a need for a great
9 deal of rudder, and in fact that maneuver, that
10 coordination maneuver, has a lot to do with control of
11 the aircraft through the rudder.

12 MR. SCHLEEDE: But you're referring to an
13 engine out situation, a V-1 type training maneuver?

14 THE WITNESS: Yes.

15 MR. SCHLEEDE: Well, I was referring to any
16 other maneuvers during simulator training where the
17 pilots are using the rudder to coordinate a turn.

18 THE WITNESS: Yes. For the abnormal, it
19 would be the partial jammed flight controls.

20 MR. SCHLEEDE: Any other maneuvers?

21 THE WITNESS: No. That would be it that I
22 know of.

1 MR. SCHLEEDE: How about during line
2 operations other than taxi operations? Is there
3 anything in flight where a pilot normal is in the 737
4 using rudder?

5 THE WITNESS: No. That would make the people
6 in the back of the airplane terribly sick.

7 MR. SCHLEEDE: And a follow up to Mr.
8 Leonard's questions about the use of the auto flight
9 system. I'm not sure if you were asked this. Could
10 you put a percentage on what a typical line pilot, what
11 percentage of his time he hand flies the airplane?

12 THE WITNESS: No, I did not. We would prefer
13 that the auto systems were used a great deal of the
14 time.

15 MR. SCHLEEDE: And so do you think that
16 that's being done? Are there some pilots out there
17 that are just hand flying it?

18 THE WITNESS: No. Some pilots like to land
19 the airplanes but by and large with the higher tech
20 airplanes, they're going more and more to the
21 technology because of the smoothness of the ride, and
22 that is more of a normal and behavior. So pilots are

1 adapting to the automation.

2 MR. SCHLEEDE: Okay. So the goal or the
3 policy is to fly with auto flight guidance system the
4 majority of the time?

5 THE WITNESS: Yes. Take advantage of all your
6 resources. That is a resource.

7 MR. SCHLEEDE: And in actual operation, what
8 do you think? Is that being complied with in the line?

9 THE WITNESS: Yes, it is.

10 MR. SCHLEEDE: Now, Mr. Leonard asked you a
11 question about whether or not you felt that the pilots
12 may have lost their flying skills and your answer to
13 that was unclear to me.

14 THE WITNESS: Well, the answer is no, they
15 have not lost their flying skills. And this is
16 identified when they come in for their proficiency
17 checks and training where they do maneuvers such as
18 steep turns, when they do the stall series, when they
19 do a single engine ILS flown manually. And they still
20 in every day operations, still manually take the
21 airplane off, and in most cases still land the
22 airplane.

1 So I don't think there's an erosion of
2 skills. Maybe a higher degree of skill today because
3 of the environment and the training that is given.

4 MR. SCHLEEDE: Is there any more time
5 involved in the training as compared to 10 years ago,
6 actual time in the simulator?

7 THE WITNESS: There is more time, yes, in the
8 simulators. In fact, at USAir, we've gone to the
9 recurrent LOFT program where we bring the First Officer
10 in twice a year instead of the mandated once a year.
11 And that's quite a cost but we do it so we can comply
12 with the advisory circular on line orientation flight
13 training and teach and evaluate in a crew environment
14 versus an individual.

15 So we do have more time dedicated in the
16 simulator programs.

17 MR. SCHLEEDE: Regarding the subject of the
18 advanced training maneuvers that you were discussing in
19 the United Program, do you know whether or not your
20 training simulators can duplicate those flight
21 maneuvers?

22 THE WITNESS: I'm positive they cannot

1 duplicate those flight maneuvers. For one, we don't
2 have G loads in the simulators, so right there it puts
3 you to a great disadvantage in trying to capture some
4 of the experiences that happen in an airplane. Plus, we
5 do have an air data package that is limited on pitch
6 and bank, that the parameters have not been expanded on
7 beyond normal flight operation.

8 MR. SCHLEEDE: So in order to do this type of
9 training simulator, you'd have to put the engineering
10 data into the simulator?

11 THE WITNESS: Yes, sir.

12 MR. SCHLEEDE: Is there a plan to do

13 that? THE WITNESS: Well, that's why
14 we're talking about this national plan working through
15 the ATA. Yes. I would say there is a plan.

16 MR. SCHLEEDE: And if you did this, would
17 this require additional training hours?

18 THE WITNESS: I would imagine so, but that
19 formulation will be conducted with this group, but I
20 would say yes.

21 MR. SCHLEEDE: Okay. And the last area. I'm
22 pretty sure you were asked but I wasn't quite clear.

1 Have you reviewed the material in connection with this
2 investigation on the flight op side?

3 THE WITNESS: Could you be more specific?

4 MR. SCHLEEDE: Well, have you reviewed the
5 Exhibit 2A series or 2 series?

6 THE WITNESS: Yes, sir.

7 MR. SCHLEEDE: How about the 12A cockpit
8 voice recorder transcript.

9 THE WITNESS: Yes.

10 MR. SCHLEEDE: Okay. Do you from that review
11 see any deviations or nonstandard performance of the
12 flight crew during this Flight 427?

13 THE WITNESS: No, I did not.

14 MR. SCHLEEDE: Thank you. That's all I have.

15 CHAIRMAN HALL: No questions?

16 Captain, just a few questions. How many
17 total pilots are you responsible for?

18 THE WITNESS: I believe the number is 4,800
19 pilots.

20 CHAIRMAN HALL: And how many of those pilots
21 fly on a 737-300?

22 THE WITNESS: I think one-third of the fleet

1 is made up of 737-300's.

2 CHAIRMAN HALL: I'm sorry?

3 THE WITNESS: I think one-third of the pilot
4 group, so I would guess maybe 1600-1800 pilots.

5 CHAIRMAN HALL: 1600. And where do you --
6 where is this training accomplished? Is it at one
7 place, around the country?

8 THE WITNESS: No. I'd love to talk about our
9 training facility in Pittsburgh, Pennsylvania and
10 Charlotte, North Carolina. In Pittsburgh, Pennsylvania
11 we have quite a complex. In a simulator building, we
12 have simulators starting with a Fokker-227, Bach-111.
13 Then for USAir operational airplanes we have a Fokker-
14 100, two DC-9's, an MD-80, two 737-300's, a 727, and
15 737-200 and a 767 -- excuse me. A 757 simulator.

16 At Charlotte we have two Boeing 737-300
17 simulators, one 737-200 and a -8 for the regional
18 carriers.

19 Also associated with that, especially in the
20 Boeing program, we have training devices and computer
21 based training.

22 I think the value, not the -- physical plant,

1 the buildings of our simulators is roughly \$180
2 [million] to \$200 million replacement.

3 CHAIRMAN HALL: And how many hours of
4 training annually would you have as a captain or first
5 officer?

6 THE WITNESS: By regulation, we would bring a
7 captain in for a pilot check of two hours and pilot
8 training of four hours, a total of six hours a year.
9 But since we've gone to the recurrent LOFT training
10 program we're actually bringing our pilots in, both
11 pilots, for eight hours of training a year.

12 CHAIRMAN HALL: In your experience, is that
13 adequate training?

14 THE WITNESS: Yes. I think it is. And with
15 the trend analysis and going through the advanced
16 qualification program, I'll be able to give more
17 details on how well we're doing with our training.

18 CHAIRMAN HALL: If there's anything else, you
19 know, USAir has gotten a lot of attention recently and
20 if there's anything additional that you think that we
21 ought to put on the record in terms of what you're
22 doing and in terms of your training and your pilot

1 training or anything involved with your group, please
2 feel free to do so.

3 General Oaks, in addition, is a Vice
4 President of Corporate Safety and regulatory
5 compliance. Are you reporting to him or what impact
6 will his addition to the overall corporate structure
7 have?

8 THE WITNESS: Well, like the advisory
9 circular in that area addresses, that's an independent
10 audit system of the flight department and the whole
11 company, so that's totally independent from the flight
12 training. I'll just get an audit or results from that
13 department.

14 CHAIRMAN HALL: So he'll be basically coming
15 in and providing an audit and oversight of your
16 responsibilities?

17 THE WITNESS: Yes. Totally independent.

18 CHAIRMAN HALL: And we have had a little talk
19 about -- a lot of talk about flight data recorders and
20 it's obvious that we don't really have as much
21 information as we might be able to have about what the
22 pilots did and didn't do on USAir Flight 427 because of

1 the flight data recorder that was on that particular
2 plane.

3 Do you have any feel on what, with your very
4 extensive experience, what type of information you feel
5 -- would feel comfortable with, and would you feel that
6 video cameras, if that was the only way to economically
7 retrofit older aircraft, would be something that you
8 would look on favorably or unfavorably?

9 THE WITNESS: Well, I'm excited in a program
10 even farther than that, and that's the FOQA that we
11 spoke about, Flight Operations Quality Assurance, where
12 electronically we would wire the airplane up maybe 160
13 plus parameters so that on removal of such a disc we
14 would have quite a snapshot of what goes on on a daily
15 basis.

16 So USAir is very active in this area and I'm
17 very supportive of that activity.

18 CHAIRMAN HALL: Well, Captain, you certain
19 have a very distinguished record and are quite an
20 effective representative for your airline and I
21 appreciate your testimony and we look forward to
22 hearing tomorrow from General Oaks. You're excused.

1 THE WITNESS: Thank you, Mr. Chairman.

2 (Witness excused.)

3 CHAIRMAN HALL: Well, that will conclude our
4 hearing for today and we will begin again tomorrow
5 morning promptly at 8:30.

6 (Whereupon, the proceeding were adjourned at
7 6:30 p.m., to be reconvened on Friday, January 27,
8 1995, at 8:30 a.m. in the same place.)

